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ABSTRACT

The development of time-series revenue projections for University of Alaska Budget Request Units (BRUs) is described. Fiscal planning modes in higher education are reviewed, along with the attributes of judgmental, time-series, and causal forecasting techniques. The following six submodels comprise the necessary dimensions of the comprehensive fiscal planning model: revenues, expenditures, programs, facilities, local needs, and environmental constraints (political, legal, economic, and human resource requirements). Attention is focused on the first phase of this quantitative fiscal planning research project: the time-series analysis of only revenue submodel components. Phase one also involved outlining a general procedure to derive nongeneral fund revenue submodel components for the University of Alaska system, and developing time-series funding years 1984 and 1985 nongeneral fund revenue component projects at the BRU level. Comparative data on original and projected revenues are analyzed. Conclusions include the following: objective methods are more accurate than subjective methods, causal methods are more accurate than naive methods, and the superiority of objective and causal methods increases as the forecast horizon increases. (SW)

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AN APPROACH TO QUANTITATIVE FISCAL PLANNING:

PHASE I REPORT

Prepared by

Thomas A. Gaylord

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CHAPTER I

INTRODUCTION

Fiscal Planning

Whenever the term planning is mentioned in higher education, there is often an outcry concerning the futility of such an activity. In outlining what he defined as a "comprehensive institutional planning process" to address this concern, Lasher (1978) stated that three basic perceptions of, or reactions to, the planning process in higher education exist. One group of executive administrators and academicians immediately think of a procedure called long-range planning in which scholarly committees meet to ponder the future of the institution, its problems and recommendations to solve these problems. As a rule, the procedure requires enormous amounts of time with thorough discussion on even the smallest of details. The usual result is a report, the long-range plan, which is produced with great fanfare only to be relegated to the book-shelf to gather dust. Frequently, long-range planning activities focus on academic goals and problems with only the slightest reference to the institution's future financial condition and even less consideration of the implications to facilities, equipment and the operating environment. In many ways, the resultant plans are more detrimental than beneficial to the future well-being of an institution.

To another group of administrators, planning immediately conjures up images of a master plan with every conceivable detail quantified and presented with extreme precision. They fear that planning for every possible occurrence will restrict their options to a point where they can act only if it is within the constraints of the plan. Related to this is the feeling that if individual or unit plans are made known to central administrators, somehow the information will be used to hurt or further control the unit.

A third group of administrators flatly reject the notion of planning asserting that it is inappropriate and irrelevant to higher education. They argue that because the institution's environment is so unstable and because it is impos-

sible to know what will happen next, and when, one can do little more than react to situations as they occur. They also argue, however, that it is important to be ready to take advantage of opportunities which come up unexpectedly (p. 1).

Although not mentioned by Lasher, there exists a fourth group of administrators that, when they become aware of planning efforts that might affect them, feel threatened. As Miller (1971) cautioned, those that engage in the planning process must be sensitive

> ... to the fact that you represent a threat to some people: most people don't like to plan since good planning tends to expose, and few people like to be exposed. (p. 154)

What the above indicates is that the planning process is defined in so many ways and the activities/results associated with it are perceived so differently that meaningful communication about any planning undertaking, whether driven by a fiscal or academic base, is severely handicapped from the onset. For the purposes of this Phase I Report, it therefore becomes necessary to put the notion of quantitative fiscal planning, as it will be used in this research project, in context.

In broad terms, fiscal planning can be defined as an ongoing, dynamic process through which decisions about future courses of action concerning the academic, physical and financial condition of an institution or system are prepared and made. Fiscal planning is long-ranged, speculative and estimate based, and by a practical necessity, political. It provides a vehicle for consistantly assessing the goals and objectives of higher education systems and institutions. Alternative ways to respond to events and organizational flexibility through planned change can be accomplished. Fiscal planning also provides for constant evaluation and the measurement of performance. As such, the process is "results oriented". Its comprehensive and integrated nature engenders and, in fact, causes ongoing communication within an organization. If properly nurtured, it results in improved success and respect for the many activities performed in a diverse organization. Table 1.1 summarizes a few of the things that fiscal planning is and is not.

Table 1.1
Characteristics of Fiscal Planning[1]

IT IS	IT IS NOT
1. An ongoing process without a specific beginning or end.	1. A project with a beginning and end.
2. Anticipatory so that alternatives maybe identified and pursued.	2. Predicting.
3. A working document or model used every day.	3. Just producing a document for the bookshelf.
4. Adaptive to the organization and controlled.	4. Bound by time.
5. Done by line personnel.	5. Done by staff personnel.
6. Diffuse throughout the organization making coordination difficult if not impossible.	6. Easy
7. Valuable and meant to be used and supported by all those of an organization.	7. Valuable to only upper management.
8. Recognition of influences and noncontrolable factors and the design of events to react to change such as enrollment patterns.	8. A guarantee for assumptions.
9. A realistic assessment of how and where we would like to be in the future.	9. Dreaming or escapism.
10. Experience applied to problems with an information base in a state of flux.	10. Necessarily narrowly scientific.
11. A method of ascertaining the logical risks to be taken.	11. A risk eliminator.
12. A systematic method for aiding decision making.	12. A substitute for decision making.
13. A vehicle for influencing results and the control of destiny.	13. A vehicle for guaranteeing results.
14. A document or automated model distributed widely in an organization and used in every day operations.	14. A secret document.

[1] Adapted from Bergstrom (1980, pp. 3-4)

Overall, the fiscal planning process incorporates the following steps:

1. Educational needs and goals - state, local and institutional - are identified, evaluated, modified and documented.

2. Missions and policies of educational systems and institutions are defined and prepared.

3. Educational programs and methods are conceived and organized.

4. Financial support and accountability for educational systems and institutions are defined.

5. Specific plans are developed, evaluated and modified in an ongoing basis.

6. Organized research and planning efforts are directed toward identifying future conditions and preparing responses for them (adapted from Foundation for Oregon Research and Education, 1978).

Quantitative fiscal planning, as a subset of the more politicized process of comprehensive fiscal planning, should incorporate data concerning students, staff, faculty, community/state demographics, state and federal regulations, curriculum, program development, program deletion, student services, enrollment projections, continuing education, community service, facilities, fiscal resources and their origins, cooperative plans with other institutions/states, human resource requirements and any marketing program (Bergstrom 1980, p.6). What is considered essential data for a quantitative fiscal planning approach is, of course, case specific. The important point to remember is that the data should be and must be reflective of the environment in which the higher education organization exists and that these **data be inter-related in a fashion that results in information.**

Armed with a theoretical definition of quantitative fiscal planning, it is essential to be cognizant of some of the analytical approaches to futures forecasting that are the tools of quantitative fiscal planning before reviewing some of the fiscal planning models in higher education that have been developed. In the next section, the attributes of judgmental, time-series and causal forecasting techniques are described.

Forecasting Techniques

Although a number of different classification schemes exist for grouping different forecasting techniques, most can be placed in one of the following groups: 1) judgmental methods, 2) time-series techniques or 3) causal models. It is intended that the brief explanations of each of the techniques that follow, taken from a more thorough treatment of the topic by Fildes (1982, pp. 83 - 104), function as a forecasting techniques "definition of terms" and also serve as a reference for this and future fiscal planning papers. The more common techniques are defined and their particular advantages and disadvantages are outlined. It should also be mentioned that most of the fiscal planning models in higher education reviewed in the next section and in general, most forecasting procedures incorporate more than one of the techniques described below.

Judgmental Forecasting

Judgmental forecasts are used primarily when good data are unavailable and when the time allotted for completing an analysis is very short. Judgmental forecasting techniques try to change subjective opinions into quantitative forecasts that can then be used. Each approach primarily relies on human judgment to interpret past data and make projections about the future.

Judgmental forecasting techniques are characterized by the fact that opinion, either individual or collective, is used to structure forecasts. Table 1.2 outlines the major judgmental forecasting techniques along with their advantages and disadvantages.

TABLE 1.2
Judgmental Methods[2]

Method	Definition	Advantages	Disadvantages
Individual (subjective) forecast	An indivdual makes a judgment about the future without reference to any set of forecasts.	Cheap if you want it to be; flexible, it can forecast anything; anybody can do it.	Accuracy suspect; although the quality of judgments can be improved by evaluating the forecaster's accuracy, skills are embodied in a person rather than the organization.
Forecasting by committee/ survey	The committee aspects are only too familiar. A variant of the committee aggregates the opinions of higher education "experts" on future prospects. Alternatively, higher education consumers can be surveyed as to their prospective objectives.	Brings different perspectives to bear on the problem; plus the advantages listed above.	One loudmouth can dominate, and he/she might not be the best forecaster; who wants to disagree with the boss in a hierarchical organization; has the disadvantages of human judgment; more expensive than individual.
Delphi	Delphi has three attributes which distinguish it from the committee: anonymity, feedback, and group response. Typically, the participants are unknown to each other. The forecasting exercise is conducted in a series of rounds with each participant offered a summary of the opinions expressed earlier, until the group response stabilizes.	As above, but attempts through anonymity to eliminate the effects of authority and group domination.	Complex; pressure toward consensus as the rounds progress; no necessary convergence to an agreed forecast; not necessarily an improvement on the more straightforward committee.

[2] Adapted from Fildes (1982, pp. 93-97)

Time-Series Methods

Time-series methods produce forecasts made for a particular variable using only that variable's history. Patterns identified in the past are assumed to hold over into the future. Table 1.3 summarizes the major time-series techniques.

TABLE 1.3
Time-Series Methods[3]

Method	Definition	Advantages	Disadvantages
Trend curves	The past observations are described as a function of time, and the identified pattern is then used to forecast ahead. Typical functions are the straight-line, exponential and the S-shaped curve. Available computer software provides a number of alternative curves. This method is often used for a long-term forecasting.	Easy to learn, to use, and to understand.	Too easy and, therefore, encourages thoughtlessness; particularly in the long term why should a curve depending only on time provide a suitable description of the distant future?
Decomposition	A time series is thought of as having four components, trend (its long-term behavior) cyclical (the longer-term swings around the trend), seasonal, and a random component left over. Once the systematic components are identified, they can be reintregrated to generate forecasts.	Intuitively plausible	No statistical rationale; not ideally suited to forecasting, and suffers from the same problems as trend curves. As a method of identifying trend, seasonal and cyclical factors it is useful.

3 Ibid, pp. 94-98

TABLE 1.3 (continued)
Time-Series Methods

Method	Definition	Advantages	Disadvantages
Exponential smoothing	The forecast is based on a the weighted sum of past observations. The weights depend on so-called smoothing parameters. Once the smoothing parameters are selected, the forecasts are simple to calculate.	Easy to computerize for a large number of trends. Very cheap to operate. Easy to setup monitoring schemes. Easily understood.	No theoretical base; misses turning points; inaccurate.
Box-Jenkins (or ARIMA) models	Like exponential smoothing the forecasts are based on a weighted sum of previous observations. However, the choice of weights is much more complex. ARIMA models offer the analyst a range of different models, and the most appropriate is selected from the particular application.	The choice of weights is wide allowing the user to identify much more subtle patterns in the data than with the previous methods. More than a technique, the Box-Jenkins approach offers a philosophy of modeling based on the principal of parsimony: the simpler the model the better.	Complex and difficult to understand; for many users it promises more than it delivers. Expensive in its use of computing time.
Bayesian	In normal applications Bayesian forecasting is similar to exponential smoothing. However, sudden changes in series behavior can take place that are essentially unpredictable, for example, a sudden drop in state oil revenues. Regular extrapolative forecasting methods require human intervention to recalibrate after such a change.	Attempts to include the probability of structural change; includes subjective information; can be used with very little data; computationally quite cheap.	Complex; little is known about its performance.

Causal Forecasting Models

Causal forecasting models mathematically relate the forecast variable to the causes that historically have influenced it. If the relationship between the variable that is to be forecast and other variables can be measured, it becomes possible to construct a causal forecast. Causal models need substantial amounts of information. Because these models tend to require a large amount of information, they are among the most expensive forecasting methods to use. Table 1.4 depicts the major causal methods used.

TABLE 1.4

Causal Forecasting Models[4]

Method	Definition	Advantages	Disadvantages
Single equation regression models.	The dependent variable Y_t is thought of as determined by a number of "causes" or "exogenous factors", as well as past values of the dependent variable itself. The relationships between Y and its causes are identified by examining past data.	If models can be developed that are sufficiently reliable, they are ideal in that they answer the question "how does the university influence enrollments?" They are control models as well as forecasting models.	The models are difficult to develop, requiring expert staff and large amounts of data that the organization often fails to collect. There still remains the problem of forecasting the exogenous factors.
Simultaneous system models	These have a similar structure to the single equation models described above with more than one dependent variable. The dependent (or endogenous) variables are then forecast by making assumptions about the future values of the exogenous variables.	Many systems do not naturally fall into the format of a single equation model. Simultaneous system models capture these inter-relationships such as those that exist among enrollment levels, programs offered, and unit costs.	High data requirements; hard to understand; statistically complex; difficult to define model; do not easily allow for nonlinearities; expensive.

4 Ibid, pp. 95-99

TABLE 1.4 (continued)
Causal Forecasting Models

Method	Definition	Advantages	Disadvantages
Simulation models	Like simultaneous models, simulation models are concerned with a large number of variables and their inter-relationships with exogenous factors. Simulation modelers stress model structure (rather than the linear structures of the regression and simultaneous system models). Typically, they include substantially more detail of the system being modeled. Identifying the model is usually much more adhoc than with the rigorous statistical models first discussed.	If properly implemented, such a model can offer the decision maker substantial help; it can be designed to be simple to use and understand; it can also solve the "right" problem.	Expensive; often high data requirements; no clear rational behind their construction; require careful validation.
Input-output models.	Input-output models are based on the idea that to obtain a given output of goods or services requires a fixed set of inputs. Once forecasts are made of student demand, input-output techniques allow the calculation of the size of a particular program needed to sustain that level of demand.	Unlike many of the techniques described, input-output is idealy suited for forecasting industrial products.	Input-output tables seldom contain sufficient detail for a university concerned with specific program mixes; they also tend to be out-of-date; it is unknown how important is the assumption of constant proportionality between input and output. Preparing a product-specific input-output table is expensive. The forecast depends on the accuracy of the initial forecast of student demand.

TABLE 1.4 (continued)
Causal Forecasting Models

Method	Definition	Advantages	Disadvantages
Cross-impact analysis	A list of events likely to have an impact on the system being analyzed is generated. The probabilities of each of these events happening are then estimated. Second, the conditional probability of event A happening given that event B has happened for all possible pairs of events A and B, is also estimated. From these assumptions it is possible to define scenarios made up of a mixture of these various events and to calculate the associated probability of each scenario.	Is able to deal with unlikely events which may have a major impact. It can deal with both quantitative and qualitative events.	The probabilities usually have to be estimated through the various judgmental methods already discussed. This may affect which scenarios are given full consideration. The choice of which events to include is also crucial. How good are we at knowing which events could conceivably affect a university. Finally, is there any evidence that cross-impact has any predictive value.

Fiscal Planning Models in Higher Education

Fiscal planning models that have been developed dealing with internal management functions in higher education can be grouped according to the following five categories:

1. Simple time table studies are concerned with better scheduling techniques for utilization of classroom space, academic staff time and other educational environmental facilities. The scarcity and high cost of human resources and of space and the complexity of the operations of the educational firm have attracted the attention of many efficiency experts to the significant improvement that can be achieved through rational planning of these resources.

2. Studies in a second group are concerned with the determination of the optimum level of educational output. These input-output models utilized a number of forecasting methods, such as time-series and regression analysis. Refined student enrollment forecasts, improved admission policies and procedures, and theories concerning the optimum size of the educational firm represent the main contributions of this group of efficiency studies.

3. A third group includes studies of the operations of the educational firm within the context of a systems approach. As a result of studies devising and testing systems of measuring and reporting activities in the institution of higher education, internal information systems are recommended. Computer simulation models were also formed and applied in several educational institutions. The most important product of this group of studies was the mathematical representation of logical relationships between the submodules of the higher-education system, and the development of the institution's administrative information system.

4. The fourth group of efficiency studies involves the financial problems of the institution of higher education regarding 1) the determination of the share of each source of funds in financing the institution's operational expenses, and 2) the evaluation of endowment and the composition of the investments portfolio.

5. The fifth category of efficiency studies is the educational resource allocation model. The main concern here was to help educational administrators identify and define the institutional goals and objectives, to search for and evaluate alternatives and to establish decision criteria to be used in choosing among alternatives. Program budgeting, simultaneous system models (integer programming, dynamic programming, and linear programming), cost analysis and activity analysis techniques were suggested for application in educational firms in order to obtain maximum return from educational resources (Said, 1974, pp. 4-6).

The models that have been developed have ranged from comprehensive national planning models to narrow modeling applications as discrete as an institution's departmental level. Examples of two comprehensive national models would include the Postsecondary Education Financing Model (PEFM) developed by the National Commission on the Financing of Postsecondary Education (National Commission of Financing of Postsecondary Education, 1973), and the Federal Planning Model (FPM) developed by NCHEMS (Huckfeldt, Weathersby and Kirschling, 1973). Both models represented an attempt at comprehensive systems modeling but failed as practical planning tools (see Dresch, 1975 for an excellent review of these two models).

On a smaller scale, a number of models have been developed that simulate state higher education systems or single institutions. The most publicized models in this category include the following: EFPM (EDUCOM, 1978), RRPM (Hussain, 1971), TRADES (Hopkins and Massey, 1981), SEARCH (Keane and Daniel, 1970), HELP/PLANTRAN (Midwest Research Institute, 1972), SPS (Bassett, Chisholm, Cherin and Huckfeldt, 1977), and CAMPUS (Judy and Levine, 1965). A number of

states' agencies have developed fiscal models using single year planning horizons. Most of these models have been limited to budget formulas and have emphasized state-level standards (i.e., so many dollars per credit hour) and procedures. For a review of regression based state-level budget formulas and their possible implications to higher education in Alaska, particularly as to how they might impact university fiscal planning efforts, see A Treatise on the Issues and Concerns Raised by Community College Funding Formulas for Alaska by the Statewide Budget Office (1983).

The success of the packaged fiscal planning models has been limited. EDUCOM's EFPM developed from the Stanford TRADES model has probably received the most widespread use in the United States. The use of NCHEMS' RRPM has dwindled to less than 50 institutions while the University of Toronto's CAMPUS model is no longer being used. The State Planning Systems (SPS) model developed by NCHEMS is actively being used only in Australia, although pilot tests of the model were successful in a number of states (The University of the State of New York, State Department of Education, Office of Postsecondary Research, 1977). In sum, development of comprehensive state or campus-wide models that are designed to be applied to any higher education situation has declined since the height of this activity in the mid-1970s. A number of reasons were responsible for why this happened, the primary being that the models simply promised too much and delivered too little. Fincher (1972) summarized a survey and study by Casasco (1970a; 1970b) in which the majority of planning models in education suffered from a lack of comprehensiveness and understanding by planners:

> Casasco views the main problem as the limited scope of present models within the total planning needs of colleges and universities. Only 29 percent of the models described in his survey were found to have a sufficient degree of comprehensiveness, a fact that Casasco attributes to the failure of administrators to view institutional development within the framework of a total systems plan. Elsewhere, he has written that this has led to a preoccupation with sophisticated analytical tools that are becoming the ends of planning rather than the means. Dealing only with operational problems such as space requirements, student enrollments, and institutional budgets, these planning tools have not only been underutilized but have led to misunderstandings of their possibilities and limitations. (Fincher, 1972, p. 762)

In addition to a literature search on the topic of higher education fiscal planning models, both a telephone survey and written questionnaire were conducted. Telephone interviews with researchers from EDUCOM, Midwest Research Institute, NCHEMS, the Southern Regional Education Board, Peat, Marwick, & Mitchell, the University of Florida, Portland State University and the University of Toronto were made. Questionnaires were also sent to 20 state higher education boards. The following generalized statements summarize the conclusions from the questionnaires:

1. Although a number of institutions use large scale comprehensive fiscal planning models (e.g., Stanford, University of Minnesota), the majority of institutions conducting modeling efforts have opted for single purpose, discrete models using state-of-the-art spreadsheet software and microcomputers. Several good application examples were reported in Cause/Effect, July 1983, 6 (4). Additionally, NCHEMS is currently developing instructional examples of higher education spreadsheet models using Lotus 1-2-3 on the IBM PC.

2. The use of prepackaged, externally developed planning models has decreased at both the institution and state level. Those models still actively being used have been changed extensively by site users. Reasons for the decline have included poor model results, vendor dependency, data needs, costs, changing administrations, and poor integration into the planning process. Large scale fiscal planning models that incorporate academic, facilities, budget and other operational data are being accomplished more and more through the use of flexible data base models/report writer software. For example, Mathematica Products Group, Inc. (1982) has developed generalized financial planning software which runs on IBM mainframe computers for their RAMIS data base system that allows the user to model "what - if" situations. Similar modeling packages exist or are being developed for DEC, D/G, Honeywell and H/P mainframes which will allow user specified models to be easily constructed.

3. Most state board level modeling efforts were initially precipitated by general state economic decline and/or budget formula requirements/ results. At the present time, the use of fiscal planning models at the state level to generate alternative future higher education planning scenarios is quite limited.

In sum, recent trends in the area of fiscal planning models suggest that the objectives of any new efforts are best served by site development of more discrete or single purpose models which can eventually be integrated into a more comprehensive model. In a sense, the discrete models function as sub-models of the comprehensive model. It is this general approach that has been adopted as the strategy umbrella for the project.

Six distinct sub-models that merit detailed analysis have been identified: 1) revenues, 2) expenditures, 3) programs, 4) facilities, 5) local needs, and 6) environmental constraints (i.e., political, economic and human resource requirements). Using a three phased procedure, (comprised of researching and deriving time-series projections, quantifying various causal relationships among variables, and lastly integrating the results of the time-series and causal analyses in a fashion which will permit the generation and testing of multiple scenarios) each of the six sub-models can be constructed. In this Phase I report, the results of the time-series analysis for the revenue sub-model are presented.

The Problem

Statement of the Problem

The specific problem of the study was to develop time-series revenue projections for University of Alaska Budget Request Units (BRUs). The projections represent the first phase in a procedure which will lead to the construction of the revenue sub-model of a comprehensive fiscal planning model. The comprehensive model which will be comprised of revenue, expenditure, program, facility, local need, and environmental constraint sub-models, will facilitate the generation of alternative futures which could aid planners in formulating strategies to adapt to, prevent, or achieve a possible system future. The focus of each sub-model, and ultimately that of the comprehensive model, is not to predict the future, but rather to facilitate anticipation of many futures and the preparation of alternative strategies as system conditions such as enrollments, human resource requirements, resource allocation patterns, and social demands for educational services change. If quantitative fiscal planning is considered an integral part of a management system, outcomes of research such as this would include the following:

1. Provide a commonality of understanding about the missions and goals of an institution and the realistic strategies to implement them.
2. Summarize the profile of the institution in quantitative terms.
3. Encourage better allocation and utilization of resources.

4. Help direct energies from nonessential to essential activities.

5. Make evaluation possible in objective terms simultaneously with implementation.

6. Reduce crisis to crisis management.

7. Assist in generating funds by strengthening the institutional case with granting agencies, governmental and corporate.

8. Help insure survival and growth of the higher education system or institution (adapted from Parekah, 1977).

Indeed, the following three rather abstract questions can be hypothesized and the final success of this research programme can be measured by the degree each is answered in the affirmative:

1. Can a quantitative approach be devised for the analysis of new or competing/ conflicting goals at the university?

2. Can a methodology/model be constructed utilizing more than simple productivity proxies (i.e., number of degrees or student credit hours produced) that realisticaly measure the quality, need, efficiency and effectiveness elements of program review (creation, maintenance or deletion) and then reconcile program decisions with forecasted fiscal constraints?

3. Can diverse planning efforts be described mathematically and be useful to decision-makers?

Objectives

Specifying the goals and objectives of this initial research phase is put in context if the entire scope of the project is conceptualized. The following six **sub-models** comprise the necessary dimensions of the comprehensive fiscal planning **model**: 1) revenues, 2) expenditures, 3) programs, 4) facilities, 5) local needs, and 6) environmental constraints (political, legal, economic and human resource requirements). Each sub-model is comprised of even more discrete **components.** For example, the revenue sub-model is comprised of the following seven components: 1) Student Revenues, 2) General Funds, 3) Federal Appropriations, 4) Program Receipts, 5) Other Restricted Receipts, 6) Indirect Cost Recovery, and 7) Intra-agency Receipts. Each of these revenue components is, in turn, comprised of even more detailed and specific **factors** which must

be analyzed. Taking student revenues as an example, it is comprised of both a policy set tuition and fee schedule factor and an enrollment projection factor.

The first phase of this quantitative fiscal planning research project involves the time-series analysis of only revenue sub-model components. The successful completion of the Phase I Report required addressing the following two primary research objectives.

1. **Outline a general procedure to derive non-general fund revenue sub-model components for the University of Alaska system.**
2. **Develop time-series FY84 and FY85 non-general fund revenue component projections at the BRU level.**

Delimitations

The following were observed in the conduct of the Phase I study:

1. The development of time-series revenue projections for the revenue sub-model excluded the general fund revenue component.
2. The analysis of historical data for non-general fund revenue components (student, federal, program receipts, other restricted receipts, indirect cost recovery, and intra-agency receipts) was confined to the five year period from FY79 through FY83.
3. The planning horizon (forecast) was limited to two years.
4. Non-general fund revenue component projections for FY84 and FY85 were finalized for 14 of the 20 BRUs at the university. No projections were reported for Statewide Programs and Services, CC-Statewide Administration, Chukchi Community College, Fisheries Industrial Technology Center, Kenai Peninsula Community College, and Northwest Community College.

Justification

The overall justifications for undertaking quantitative fiscal planning efforts have been provided in previous sections. Additional impelling reasons exist for starting with the revenue sub-model. Foremost of these was the fact that the resultant revenue component projections for FY84 and FY85 could be

immediately used by the units as additional information for building their FY85 budget requests for the state. In Chapter III, the influence the projections had on the final FY85 budget request document are summarized.

Another state budget request related justification involves the new approach to budgeting that the state has adopted, the zero base budgeting (ZBB) approach. Although the university uses line item, program, and ZBB at different levels and stages in the budget process, it has presented its budget request to the state using the incremental budget approach. The state's change to ZBB will require the university to include more, better, and different information than needed for a state budget request built on the incremental approach. As the orientation of ZBB is more future oriented and its utility to planning is greater, the need for good revenue component projections grows. For reference, a comparison of the characteristics of the budget approaches mentioned is provided in Table 1.5.

The more accurate an organization's revenue projections are, the more confident the organization can be of realizing its planned expenditure pattern. When the university has to adjust planned expenditure patterns, change requests go through a budget revision process which, by its nature, takes time and consumes personnel. Figure 1.1 shows the number of university budget revisions processed by month during FY83. Some of these revisions occurred due to revenue projections that failed to match expectations. Improved revenue projections can be used to reduce the budget revision workload.

Peculiar to public institutions and the relationship of revenues with expenditures are the restrictions on lapsing funds and deficit spending. The university simply cannot expend funds in excess of the amount granted by the state. Additionally, any unexpended funds lapse back to the state. In a sense, the lapsing/deficit situation can be represented as a minimization problem. The goal is to further minimize the funds that lapse while at the same time, avoid any deficit spending. Figure 1.2 shows the university lapse history since FY79 indicating significant reductions in lapse amounts in recent years. By increasing revenue projection accuracy, the probability of large lapses should be lessened even more.

TABLE 1.5
A Comparison of Current Budget Approaches[5]

Budget Approach	Defined	Distinguishing Characteristics	Advantages	Disadvantages
Line Item	Itemization/ listing of each budget item.	Found in all budgets	All levels have input	Reduce line items without regard to impact. Limit discretion.
Program	Line item by program		Includes inputs and outputs and cost analysis.	
PPB	Rational application of criteria to budget decisions.	Centralized.	Helps decisions Qualitative & quantitative Can see shortcomings Result oriented	Not an operating tool. Various levels of funding not evaluated No priorities among programs.
ZBB	Start with 0$ every year and justify.	Decentralized	Force to replan. Focuses on tasks. Comparative	No operational data. Narrow in scope.
Incremental	Add onto last years base.	Most common. Oldest form.	Least work. Politically expedient. Tendency to approve.	Status quo. Not necessarily supportive of goals.
Formula Based	Uses formulas for computing expenditures.	Used primarily at state level.	Equal treatment among and within institutions. Promotes communication at state level. Reduces subjectivity.	Inhibits change/ innovation Misused. Lacks quality control. Defeats incentives.

Aproaches	Affects	Process	Comments	Aids Planning	Orientation
Line Item	Short Range	Bottom Up		No	Present
Program	Short Range	Mid-level up		No	Present
PPB	Long range	Top down	Facilitates Policy decisions	Yes	Future
ZBB	Short range	Bottom Up	Emphasizes decision packages	Yes	Future
Incremental	Short range	Bottom up		No	Present
Formula Based	Short range			Yes	Present

[5] Adapted from Emery (1980, pp. 7-8)

FIGURE 1.1

TOTAL UNIVERSITY OF ALASKA FY83
BUDGET REVISIONS BY MONTH

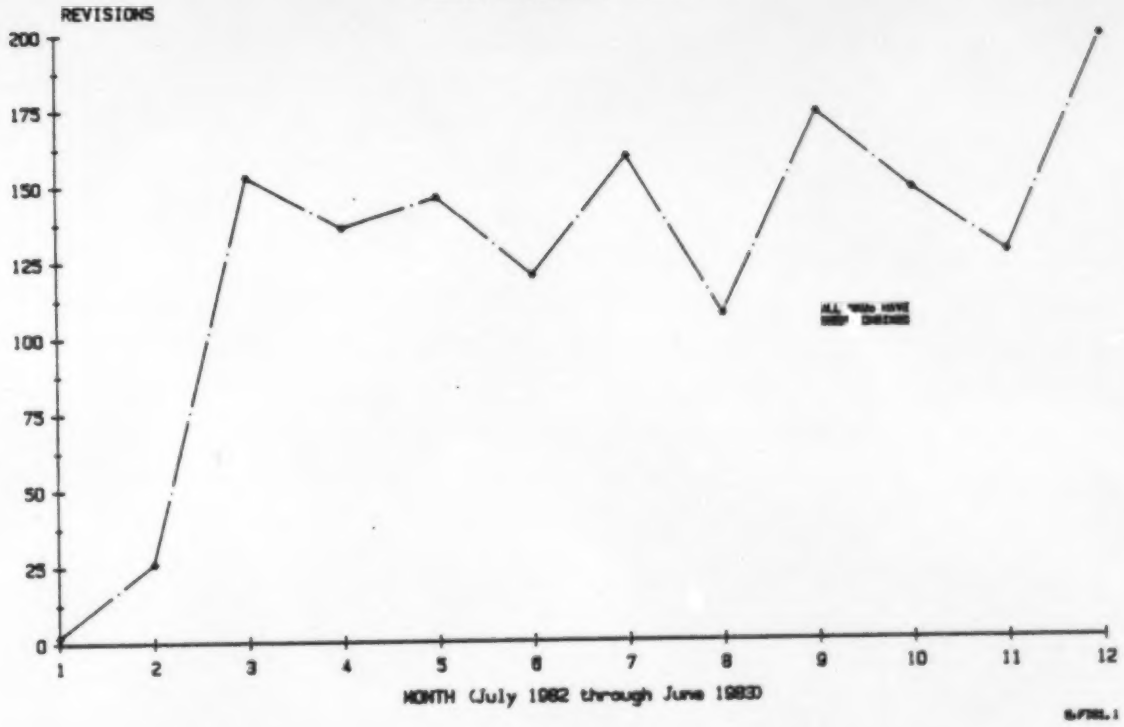
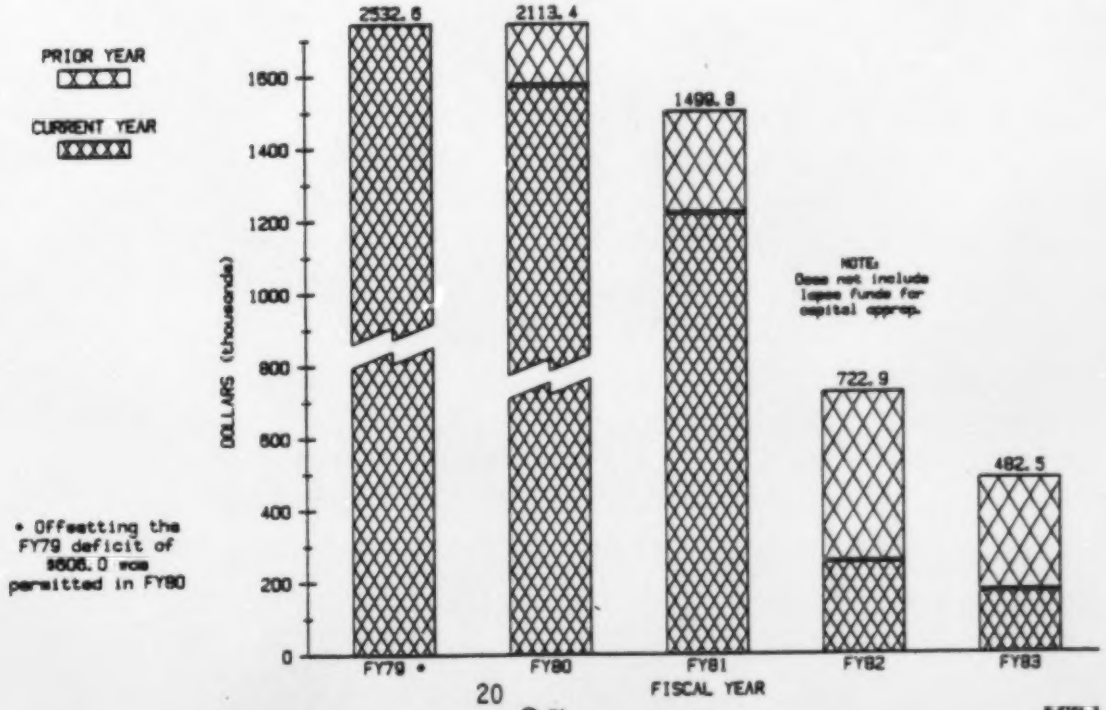


FIGURE 1.2

UNIVERSITY OF ALASKA LAPSE HISTORY
FY79 - FY83



Aside from the beneficial effects improved revenue component projections have on the budgeting/expenditure process, several holistic statements can be made concerning the contributions that can be derived from this approach to planning. Few higher education quantitative planning models have utilized the inventive futures approach for medium- or long-range planning (Johnstone, 1974). The principal characteristic of the inventive approach is the recognition that the future is not a predetermined extrapolation of the past, but rather, it consists of an array of alternative futures which can be explained in some detail. The approach embodies the assertion that it is both possible and desirable to intervene creatively in the present to bring about a more desirable future (Ziegler, 1972, p. 8). The ultimate goal of this quantitative fiscal planning approach is the generation and testing of multiple future scenarios (revenue, expenditure, etc.) used in preparing strategies to adapt to, prevent, or help achieve a particular scenario. In this aspect therefore, the study is, therefore, heuristic.

Lastly, extending planning models designed for one unit or subsystem of a state higher education system to the entire system is a function of information availability and the standardization of data definitions (Harcleroad, 1971, pp 34-38). The difficulty to date in obtaining accurate data that are comparable from one year to the next demonstrates the need for a statewide MIS.

Study Overview

The Phase I Report is comprised of four chapters. Chapter I introduces the principal concepts involved with fiscal planning, various forecasting techniques are described, fiscal planning models that have been used in higher education are summarized and a statement of the problem, objectives, delimitations, and justification of the study are presented. Chapter II addresses the first primary study objective, that being to outline a general procedure for deriving revenue sub-model component forecasts for BRUs in the University of Alaska system. Chapter III addresses the second primary study objective and presents the results of the FY84 and FY85 time-series revenue component projections. Lastly, Chapter IV is a summary of the caveats to be aware of when interpreting the results included in this initial phase of research.

CHAPTER II

REVENUE FORECASTING MODEL

Introduction

The intent of this chapter is to address the first primary research objective:

> **Outline a general procedure to derive non-general fund revenue sub-model components for the University of Alaska system.**

To ascertain realistic projections for the non-general fund revenue, a phased approach was constructed consisting of the following three steps:

1. The first phase involves the analysis of historical trend data for each non-general fund revenue component at each BRU utilizing various time-series forecasting methods.

2. The second phase requires researching various causal factors that affect revenues and determining the relationships that exist among the revenue components themselves.

3. Lastly, model parameters would be refined through a planned sequence of relationship testing procedures. The capability to generate multiple planning/policy scenarios and see the resultant impact on revenues would then be possible.

The remainder of this chapter details the procedure used for the first phase of the study. Additionally, brief descriptions of the procedures that will be followed for the second and third phases are also provided.

Procedure

Phase I - Time-Series Analysis

DATA

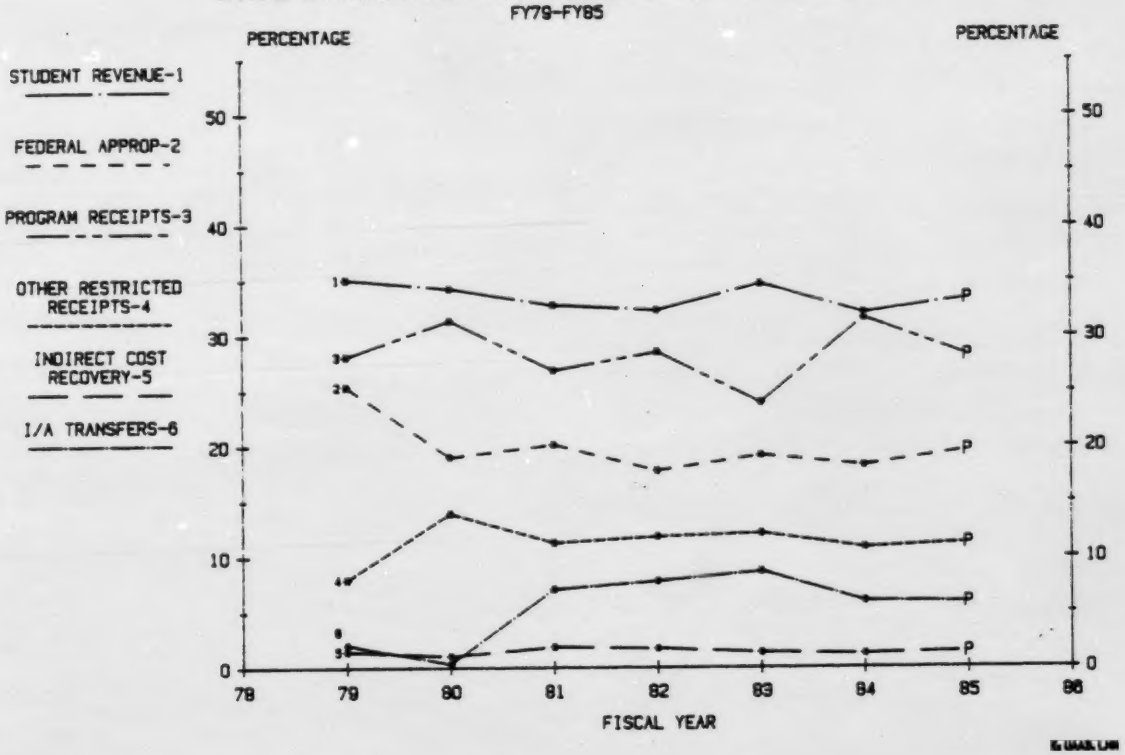
The preliminary compilation of revenue data prior to FY81 for the six revenue components that were modeled (student revenue, federal appropriations, program receipts, other restricted receipts, indirect cost recovery and intra-agency receipts) came from revenue analyses previously done by the Statewide Budget Office. For FY81 through FY83, year-ending FAS reports were used. Additionally, a problem in using the FAS data had to be addressed since numerous object code changes have been made over the last three years. An object code crosswalk was developed to resolve this. Once the object code revenues were summed under each revenue component and combined with the older analyses, the preliminary data were sent to the appropriate MAU for verification.

PROJECTIONS

The initial analysis of the non-general fund revenue components for each BRU involved relating each revenue component dollar amount with the total non-general fund revenue received by that BRU for each fiscal year. This "proportional analysis" of the revenues uncovered the interesting result that these revenue component proportions or ratios possess considerably more stability than do component dollar amounts. Figure 2.1 shows the rather consistant behavior over time of the non-general fund revenue proportions at UAA. Similarly at other BRUs, the stability of the proportions of each non-general fund revenue component to the total non-general fund amount were greater than their respective dollar amounts by fiscal year. It was this characteristic that prompted the methodology to derive revenue component projections. It was decided that for short range projections (one to two years) a moving average approach applied to the proportions of each non-general fund revenue component to the total non-general fund revenue would be used. Depending upon the characteristics of the historical non-general fund revenue component trends at a BRU, the moving average chosen was either a five year moving average, a four year moving average or a three year moving average.

FIGURE 2.1

INITIAL UAA PROPORTIONAL AVERAGE NON-GENERAL FUND REVENUE ANALYSIS
FY79-FY85



After each non-general fund revenue proportion had been projected, the next step was to derive total non-general fund revenue projections for FY84 and FY85. Again depending upon the historical total non-general fund revenue values over time, either a linear regression or a double exponential smoothing procedure was used to make the forecast. Briefly, regression is a statistical technique that measures the relationship between a dependent variable, (total non-general fund revenue at a BRU) and the independent variable (fiscal year). What regression does is plot the actual dependent variable values (Y) and independent variable values (X) and then fit a straight line among the values. The line is determined by the least squares solution which means that the sum of the squared deviations between actual and predicted squares is minimized. In calculating the line, one must determine the parameters of "a" and "b" (i.e., the intercept and the slope of the line). The intercept (a) is the point where the line intersects the Y or dependent variable axis. The slope of the line (b) determines the rate of increase or decrease in Y as the value of X increases by one unit. The slope of the line is, thus, the weight that is attached to X. The formula for the simple regression equation is expressed as follows:

$$Y' = a + b * X \qquad (2.1)$$

where

- Y' is the predicted value (future total non-general fund revenue),
- a is the intercept or constant,
- b is the regression weight attached to X (slope of the line),
- X is the independent variable (fiscal year).

A more detailed explanation of regression can be found in Draper and Smith (1981).

Exponential smoothing is a type of moving average that circumvents some of the short comings which limit the attractiveness of the traditional moving average as a forecasting tool. In exponential smoothing, we assign weights to past data such that the weights have decreasing magnitude for increasing data age. It emphasizes that in a changing process recent data may be more valid than older data for projecting future activity levels.

The algorithm for deriving a one year single exponential smoothing forecast of a BRU's total non-general fund revenue based on five years of historical data is made utilizing the following formula:

$$S_{t+1} = \alpha X_t + (1-\alpha)\, S_t \qquad (2.2)$$

where

- S_{t+1} is the single exponential smoothing total non-general fund revenue for fiscal year t+1,
- α is the exponential smoothing constant (weight) which has a value from zero to one,
- X_t is the actual total non-general fund revenue data value for historical fiscal year t,
- S_t is the previously derived single exponential smoothing total non-general fund revenue for fiscal year t.

Mechanically, the first two historical (oldest) data values are used to get the algorithm started. The revenue forecast for the third historical year is then

$$S_3 = \alpha X_2 + (1-\alpha)\ X_1 \qquad (2.3)$$

where the actual historical data values for the first two years are needed together since no initial (S_t) forecast exists. The fourth and fifth period forecasts are:

$$S_4 = \alpha X_3 + (1-\alpha)\ S_3 \qquad (2.4)$$

$$S_5 = \alpha X_4 + (1-\alpha)\ S_4 \qquad (2.5)$$

With the historical data to this point being used to derive the single exponential smoothing forecast for our most recent actual value, the future forecast for the next fiscal year is now possible where:

$$S_6 \text{ (next year's revenue)} = \alpha X_5 + (1-\alpha)\ S_5 \qquad (2.6)$$

In sum, the the new forecast is equal to the last forecast plus a fraction of the difference between the last actual data point and the last forecast. As Wheelwright and Makridakis (1973) stated:

> To utilize exponential smoothing a manager need have only the most recent observed value, the most recent forecast, and a value for α. However, just as moving averages have severe limitations when basic changes are made in the underlying pattern of the variable being forecast, exponential smoothing has similar limitations. When the manager expects that a ramp change ... a step change ... or some other type of complex pattern exists in the data, exponential smoothing will probably be unsatisfactory for meeting his forecasting needs. A final limitation in both exponential smoothing and moving averages is that there is no good rule for determining the appropriate value of the weights. For moving averages the manager must decide what this value is by specifying how many observations to include in the average; in exponential smoothing he must do so by selecting a value of α. Most often this is done experimentally by trying two or three different values to see which is most appropriate. (p. 39)

Double exponential smoothing can generally be characterized as a second smoothing level so as to allow for both level and trend components in a time-series. If a trend is present, the model implied by equation 2.2 will lag the time-series; therefore, some adjustment to the trend is necessary. Double smoothing allows such an adjustment by defining both a single and double exponential smoothed average and then combining these mathematically to produce estimates of the level and trend components for forecasting.

For the interested reader, a more detailed explanation and equations of the double exponential smoothing method can be found in Wheelwright and Makridakis (1973, pp. 44-47).

UNIT REVIEW

Once the forecasts for the proportion of each non-general fund revenue component by BRU were completed and either a linear regression or double exponential smoothing total non-general fund projection was made, the resultant dollar projections for each non-general fund revenue were derived for FY84 and FY85. The projections were distributed to the MAUs for their review and recommendations. It was possible for a number of these recommendations to be incorporated into the FY85 budget request.

Chapter III summarizes the original time-series projections for each of the BRUs in the study for FY84 and FY85. The impact that the revenue component projections had on the original FY85 budget request document values for FY84 revised revenue amounts and FY85 projected revenue amounts are also provided.

Phase II - Causal Models

The second phase of the development of an integrated revenue sub-model for the University of Alaska system will involve researching various causal factors contained within each of the revenue components. Additionally, the relationships between revenue components will be investigated. What this actually entails can best be described by using an example for outlining the possible derivation of the causal model for one particular revenue component.

The derivation of the causal factors for the student revenue model will serve as an example since it is conceptually the easiest to explain. The derivation of a student revenue causal model would involve basically two dimensions. First, a tuition and fee schedule factor and second an enrollment forecast factor.

The tuition and fee schedule factor itself is a policy determined factor in the model. It would necessarily have to delimit, for example, various consolidation levels, address the difference between in-state and out-of-state charges as well as the difference between various course level charges. The decision to change aspects of the schedule are not completely independent of enrollment forecasts. Obviously, the raising of tuition and fee requirements could reach a threshhold where they would affect the enrollments that would be expected. Too high a tuition and fee schedule would reduce the enrollment forecasts while a decrease of tuition and fee charges might have the opposite affect.

The second major causal dimension of the student revenue component is the enrollment forecast factor. Five general variables that might be researched include: 1) student characteristics, 2) service area demographics, 3) higher education costs, 4) program/facilities, and 5) general economic factors.

Information on student characteristics would be derived primarily from the student information system data base, questionnaires and also require some original research. Data would be compiled concerning a number of student characteristics including information on transfer students, retention, average course load, level of the student and major. Information can also be obtained by utilizing the Alaska Senior Survey Questionnaire that is administered on a yearly basis by the Department of Education.

Service area demographics for each of the institutions would be researched to determine the relationships between such things as population forecasts and enrollments. Demographic information can obtained from ISER and U.S. Census data tapes.

Higher education costs need to be researched to determine the impact they have on enrollments. This would include monitoring feedback from altering tuition and fee schedules and the availability of student loans. Alaska State Loan Program information could be used in this area.

The impact of degree program changes and facilities impact enrollments at particular institutions. Such things as new dormitories or establishing a branch campus most definitly impact enrollments.

Lastly, general economic variables need to be investigated. The impact of unemployment or the changes in cost of living as well as the specific training for and the availability of jobs profoundly affect not only the level of enrollments but the types of programs in highest demand.

Figure 2.2 graphically relates the causal factors and their variable areas that comprise the hypothesized student revenue component. The precise variables and the degree to which each impact enrollment requires a significant amount of research to determine.

The above analysis for deriving a student revenue causal model was provided as an example outline of what analysis would be necessary for each of the non-general fund revenue components. The process of delimiting what relationships exist and their magnitude require the concerted efforts of individuals not only in the finance area in each of the BRUs, but also in the areas of admissions and records, institutional studies, facilities planning, and economic research.

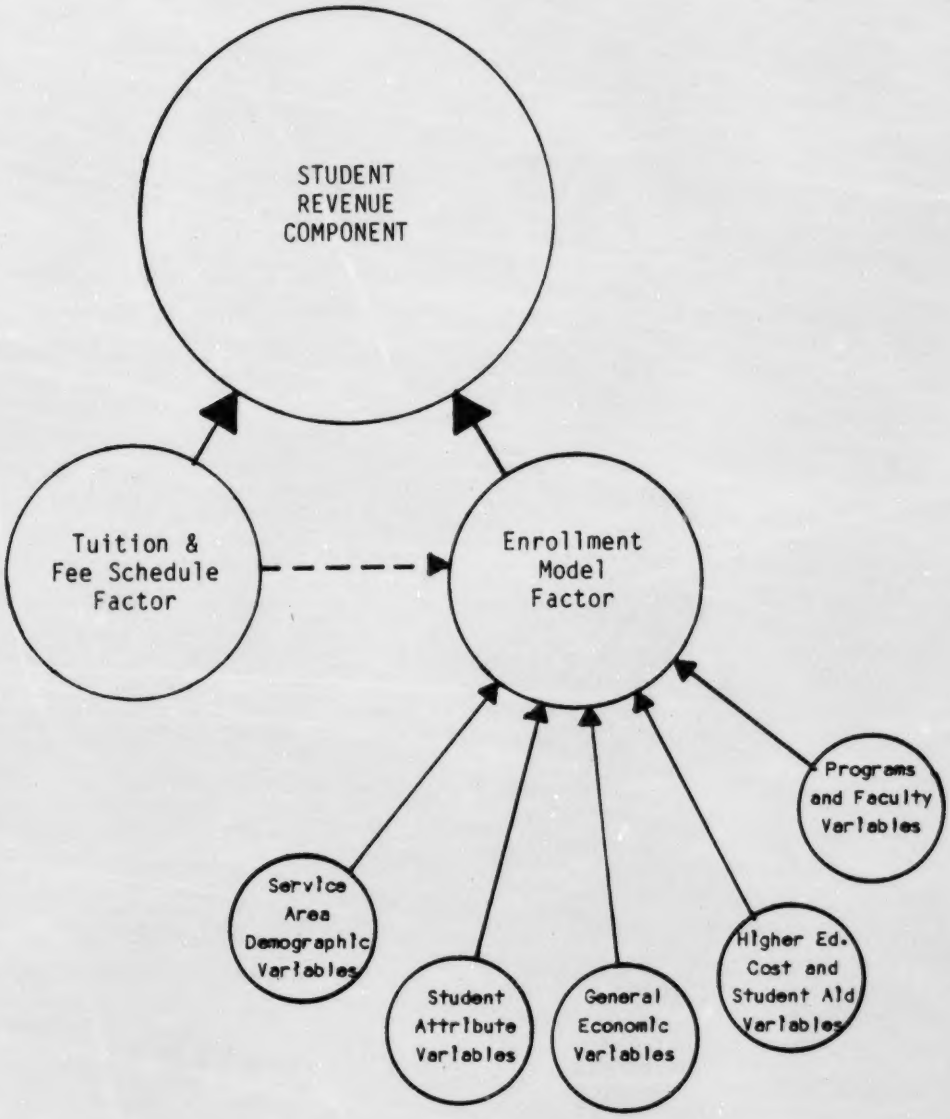
Phase III - Scenario Generation

The third and final phase of the revenue sub-model development would include integrating each of the separate revenue components that have been developed to this point and refining the relationships not only within the components but among the components. It is during this third phase that the component relationships would be programmed utilizing the new administrative computer.

FIGURE 2.2

CAUSAL FACTORS

COMPRISING THE STUDENT REVENUE COMPONENT


STUDENT REVENUE COMPONENT
Tuition & Fee Schedule Factor
Enrollment Model Factor
Service Area Demographic Variables
Student Attribute Variables
General Economic Variables
Higher Ed. Cost and Student Aid Variables
Programs and Faculty Variables

With the models integrated and written for an automated environment, "what if analysis" (i.e. policy analysis) would be possible. Changing the student fee schedule could be investigated to ascertain the impact on the student revenue component and on the other revenue components. It would be used to research questions such as how much additional student revenue would be generated, how would enrollment be affected, and how might other revenues be affected.

At this stage of development, another sub-model (other than the revenue sub-model) of the comprehensive fiscal planning model could be investigated. As mentioned, these include expenditures, programs, facilities, local needs and environmental constraints sub-models. Once all of these other fiscal planning sub-models are at the scenario generation phase they, in turn, must be integrated together in the comprehensive model. Relationships among each of these six sub-models would then have to be researched and expressed mathematically.

Summary

A three phased approach was outlined as the procedure to derive revenue component forecasts for each BRU in the University of Alaska system. The first phase involves researching the historical trend data for each revenue component. The second phase is comprised of research in the areas of causal factors for each revenue component. The third and last phase integrates all that has been learned from both the time-series analysis and causal analysis into an automated revenue sub-model that is capable of generating multiple scenarios for policy analysis.

CHAPTER III

TIME-SERIES ANALYSIS RESULTS

In this chapter, the results of developing various time-series non-general fund revenue component projections for the 14 university budget request units (BRUs) analyzed are presented. The results address the second primary research objective:

> **Develop time-series FY84 and FY85 non-general fund revenue component projections at the BRU level.**

A Comparison of Original and Projected Revenues

Before looking that the projection details, a few notes are in order to briefly review how to read the figures and tables that follow. Regarding the Figure 3.1, recall that the general procedure in deriving the projections initially required compiling non-general fund revenue component data for FY79 through FY83 and then having the appropriate BRUs review these data. The data actuals that resulted are plotted in Figure 3.1. Next, either a linear least squares or double exponential smoothing projection was made of the total non-general fund revenue. In Figure 3.1 the two vertical axis that are plotted are scaled separately. The left axis is scaled less than the right to show more of the detail of the smaller revenue components. Each of the six non-general fund revenue components is plotted to the scale on the left axis. The right axis is scaled in order to have the total non-general fund revenue on the same graph. This total revenue is the solid line in Figure 3.1 which also has the actual total data values beside each point. Once the total non-general fund revenue projections for FY84 and FY85 were made, projections for each of the revenue components were derived through a proportional analysis procedure. In Figure 3.1 the projection data points for each of the non-general fund revenue components are indicated by P's. Projected values for each of the revenue components as well as a total non-general fund revenue for FY84 and FY85 are provided in Table 3.1. Once the revenue component projections were made, they were distributed to each unit for their review and possible incorporation into FY84 and FY85 budgets. The original revenues listed in Table 3.1 represent the unit's original budgets developed prior to obtaining the projection data. Any changes to the original budgeted revenues that resulted due to the information provided through the time-series projection analysis are mentioned in the text that follows. With the procedure on how to read and relate the figures and tables outlined, the succeeding comparisons of original and projected revenues can be made.

Figure 3.1 and Table 3.1 depict the historical and projected revenue component values for UA/Fairbanks. Both the FY84 and FY85 total revenue projections are lower than the original values, although the FY84 total is not significantly different. When reviewing the differences between original and projected component values, percentage differences in excess of plus or minus ten percent were targeted for review and consultation with the units to understand the reason why the time-series projections might differ so greatly from the original anticipated values. For UA/Fairbanks the targeted revenue components included other restricted receipts for FY84 and FY85, indirect cost recovery for both FY84 and FY85 and intra-agency receipts for FY84. The reason for the difference in other restricted receipts was given as being due to the addition of $1,500.0 (this and following figures in thousands of dollars) for the museum. Indirect cost recovery revenue was expected to increase at a rate out of line with historical amounts partly due to the fact that the increases that were anticipated in FY83 will not be realized until FY84. The difference between the original and projected inter-agency receipt revenue for FY84 was not sufficiently ascertained. No FY84 or FY85 original budget values were adjusted for UA/Fairbanks due to the revenue projections.

Historical and projected revenue component values for Organized Research are provided in Figure 3.2 and Table 3.2. The total non-general fund projections for Organized Research were more than $3,000.0 less than the original values for both FY84 and FY85. Federal revenue for FY84 and FY85 as well as other restricted receipts for FY84 and FY85 were targeted for review. Although projections for intra-agency receipts differed by more than 20 percent from the original values, the actual dollar amounts involved were not significant in relation to other revenue components and, therefore, this revenue component was not targeted. UA/Fairbanks felt strongly that the original FY84 federal revenue value was a good number due to the fact that previously anticipated federal cutbacks did not materialize. However, it was agreed that the FY85 original value contained excess authority and was reduced by $1,000.0. The FY84 and FY85 other restricted receipts revenue values were not changed because of the strong feeling that the anticipated growth levels would be obtained. This was more of a general feeling than a case by case justification. As a result the FY85 budget request amount for federal revenues was downward adjusted by $1,000.0 partly due to the information provided by the revenue component projections.

FIGURE 3.1

UAF FY84 AND FY85 NON-GENERAL FUND
REVENUE PROJECTIONS

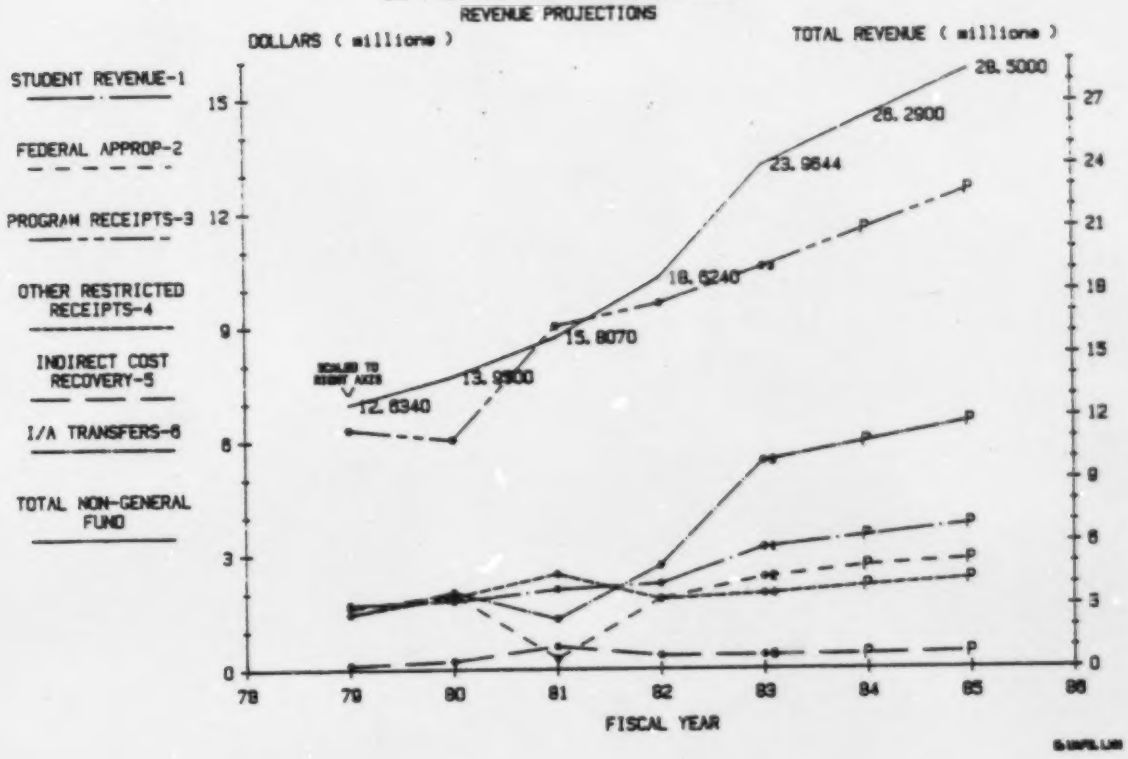


TABLE 3.1

UAF Original vs. Projected Revenue *

Revenue Category		Revised FY84 Budget (X $1,000)	Percentage Difference	FY85 Budget (X $1,000)	Percentage Difference
Federal	Original	$ 2,478.9		$ 2,478.9	
	Projected	2,700.0	8.92	2,860.0	15.37
Other Restricted	Original	4,027.1		4,755.6	
	Projected	2,170.0	(46.12)	2,350.0	(50.58)
Student Fees	Original	3,662.2		4,014.1	
	Projected	3,490.0	(4.70)	3,790.0	(5.58)
Program Receipts	Original	11,085.3		11,967.5	
	Projected	11,570.0	4.37	12,580.0	5.12
Indirect Cost Recovery	Original	1,320.2		1,388.2	
	Projected	380.0	(71.22)	420.0	(69.74)
Intra-agency Receipts	Original	4,023.5		6,416.8	
	Projected	5,980.0	48.63	6,500.0	1.28
Total	Original	$26,597.2		$31,021.1	
	Projected	$26,290.0	(1.16)	$28,300.0	(8.13)

* UA/Fairbanks FY84 numbers are Authorized budget numbers.

FIGURE 3.2

OR FY84 AND FY85 NON-GENERAL FUND
REVENUE PROJECTIONS

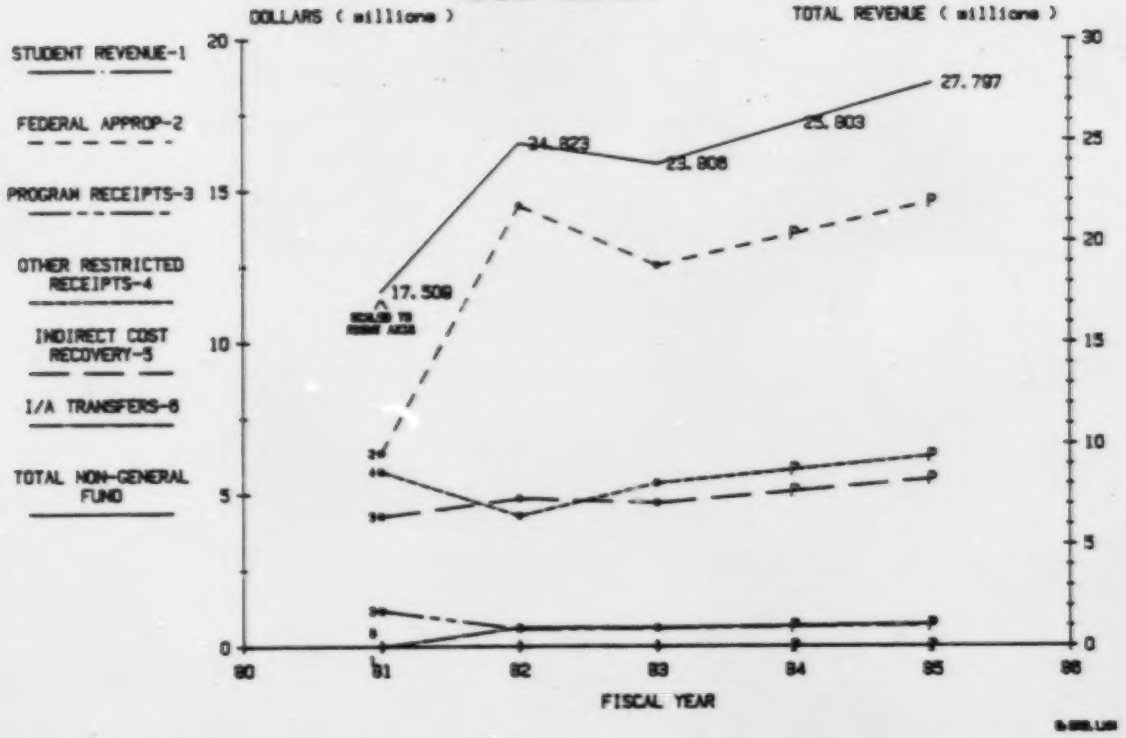


TABLE 3.2

OR Original vs. Projected Revenue *

Revenue Category		Revised FY84 Budget (X $1,000)	Percentage Difference	FY85 Budget (X $1,000)	Percentage Difference
Federal	Original	$15,353.6		$17,353.6	
	Projected	13,575.0	(11.58)	14,626.0	(15.72)
Other Restricted	Original	7,082.0		7,082.0	
	Projected	5,817.0	(17.86)	6,266.0	(11.52)
Student Fees	Original	0.0		0.0	
	Projected	0.0	0.00	0.0	0.00
Program Receipts	Original	620.7		620.7	
	Projected	633.0	1.98	681.0	9.71
Indirect Cost Recovery	Original	5,036.4		5,036.4	
	Projected	5,109.0	1.44	5,504.0	9.28
Intra-agency Receipts	Original	880.5		880.5	
	Projected	669.0	(24.02)	720.0	(22.29)
Total	Original	$28,973.2		$30,973.2	
	Projected	$25,803.0	(10.94)	$27,797.0	(10.25)

* Organized Research FY84 numbers are Authorized budget numbers.

UA/Anchorage original and projected revenue component values are depicted in Figure 3.3 and Table 3.3. The total non-general fund projections for FY84 and FY85 did not differ significantly from the original total revenue values. Only the indirect cost recovery FY85 projection and the intra-agency receipts projection for FY84 differed by more than ten percent. However, the dollar magnitudes of both of these revenue components were small in relation to the other revenue components and, therefore, these differences were not interpreted as needing to be reviewed. As indicated in Figure 3.3, the historical revenue data for UA/Anchorage starts in FY80 and not FY79 as do historical data for other BRUs. At the request of UA/Anchorage, FY79 data were not included in constructing the revenue projections because of the difficultly in separating out the revenues that were mixed between UA/Anchorage and Anchorage Community College in that year. Similarly, Anchorage Community College's projections were derived using a base that excluded the FY79 data. Even though the original revenue values were very close to the projected revenue values, the projection information was used by UA/Anchorage to reduce the program receipt value in FY84 by $250.0 to bring it more in line with the projected program receipt value. The reason given was that the original revenue value was based on the activity of the new campus bookstore, which for FY84 was subsequently felt high.

Non-general fund revenue component actuals and projections for UA/Juneau are provided in Figure 3.4 and Table 3.4. The FY84 total non-general fund projection was more than 15 percent less than the original total revenue value. Figure 3.4 shows that in FY82 there was a dramatic rise in other restricted receipts due to the funding of the "university within walls" project for the prison. The following year the project was not funded. The FY85 projection total did not differ significantly from the original value. For UA/Juneau every single revenue component projection for both FY84 and FY85 differed from the original value by more than ten percent. With UA/Juneau it was possible to determine that the projections for student revenues for FY84 and FY85 would be high due to the dramatic increase in student revenues in FY83 from increased activity in conferences and off-campus enrollment. This single year pushed up the projections which UA/Juneau felt would not be obtained. Arriving at precise reasons why other original revenue levels differed from the projected revenues by the degree they did, was not possible. The net effect was that the revenue projections did not impact the FY84 or FY85 UA/Juneau budgets.

FIGURE 3.3

UAA FY84 AND FY85 NON-GENERAL FUND
REVENUE PROJECTIONS

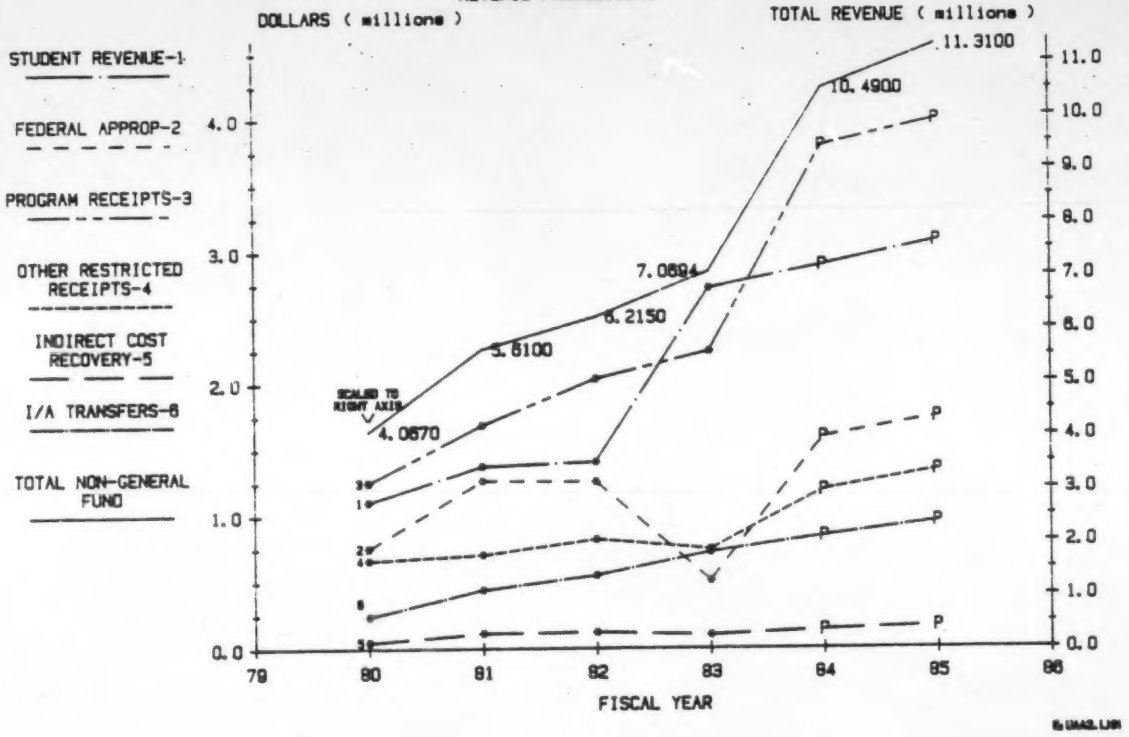


TABLE 3.3

UAA Original vs. Projected Revenue

Revenue Category		Revised FY84 Budget (X $1,000)	Percentage Difference	FY85 Budget (X $1,000)	Percentage Difference
Federal	Original	$ 1,664.3		$ 1,664.3	
	Projected	1,600.0	(3.86)	1,750.0	5.15
Other Restricted	Original	1,268.5		1,268.5	
	Projected	1,200.0	(5.40)	1,350.0	6.42
Student Fees	Original	3,004.3		3,004.3	
	Projected	2,900.0	(3.47)	3,080.0	2.52
Program Receipts	Original	4,010.7		4,010.7	
	Projected	3,800.0	(5.25)	4,000.0	(0.27)
Indirect Cost Recovery	Original	136.4		136.4	
	Projected	140.0	2.64	169.0	23.90
Intra-agency Receipts	Original	1,026.3		1,026.3	
	Projected	850.0	(17.18)	961.0	(6.80)
Total	Original	$11,110.5		$11,110.5	
	Projected	$10,490.0	(5.58)	$11,310.0	1.80

FIGURE 3.4

UAJ FY84 AND FY85 NON-GENERAL FUND
REVENUE PROJECTIONS

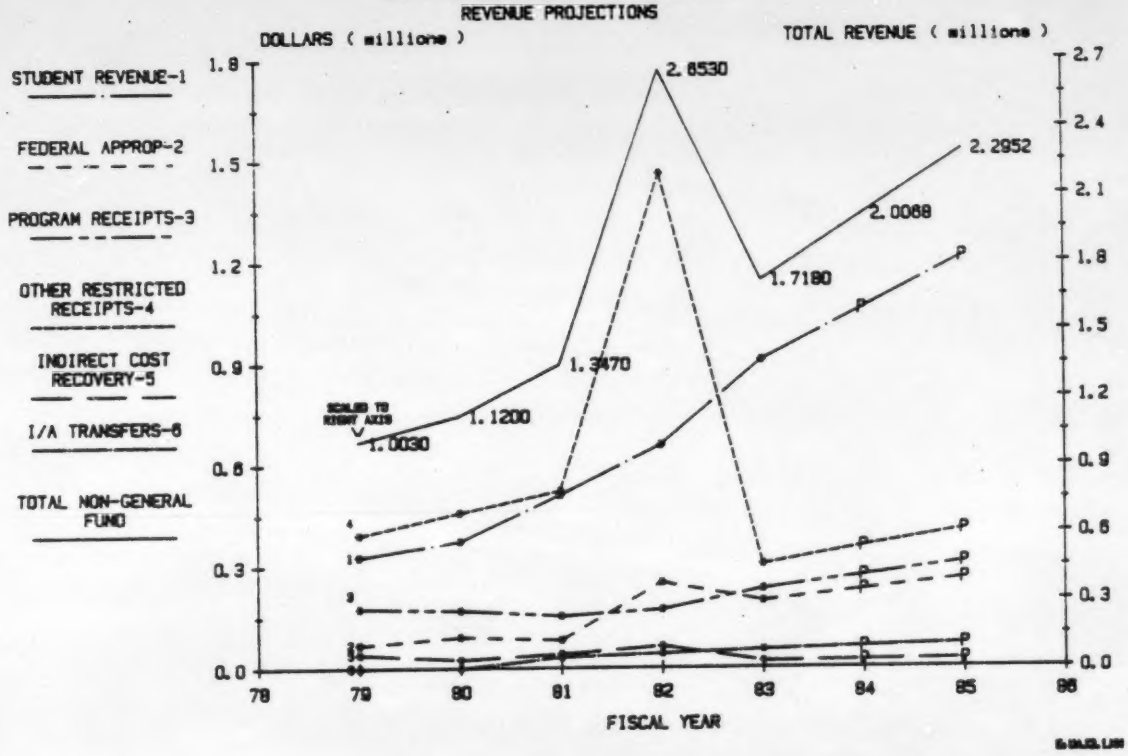


TABLE 3.4

UAJ Original vs. Projected Revenue

Revenue Category		Revised FY84 Budget (X $1,000)	Percentage Difference	FY85 Budget (X $1,000)	Percentage Difference
Federal	Original	$ 335.6		$ 335.6	
	Projected	230.6	(31.29)	263.7	(21.42)
Other Restricted	Original	692.9		605.9	
	Projected	357.4	(48.42)	408.7	(32.55)
Student Fees	Original	893.4		1,010.4	
	Projected	1,062.3	18.91	1,215.0	20.25
Program Receipts	Original	395.9		395.9	
	Projected	272.5	(31.17)	311.7	(21.27)
Indirect Cost Recovery	Original	29.6		29.6	
	Projected	21.8	(26.35)	25.0	(15.54)
Intra-agency Receipts	Original	30.3		30.3	
	Projected	62.2	105.28	71.1	57.38
Total	Original	$ 2,377.7		$ 2,407.7	
	Projected	$ 2,006.8	(15.60)	$ 2,295.2	(4.67)

Figure 3.5 and Table 3.5 compare projected and original revenue component values for Anchorage Community College. The FY84 and FY85 total non-general fund projections did not differ significantly from the original total revenue values. Anchorage Community College felt comfortable with all of their FY84 and FY85 original revenue values. Consequently, no changes were made. Although FY79 data for Anchorage Community College are presented in Figure 3.5, these data were not used to help project future revenue values. The reason being that, as mentioned previously for UA/Anchorage, in FY79 both units combined budget and accounting procedures in such a fashion that prorating the amount of each revenue source to the correct unit was too difficult. At Anchorage Community College's request, the revenue projections were extended another year to FY86 for their review and analysis. The FY86 projections for Anchorage Community College were adopted by the unit as their long-range revenue expectations and were incorporated into the FY85 budget request.

Figure 3.6 and Table 3.6 show the historical and projected revenue component values for Cooperative Extension Service. The FY84 total non-general fund projection was more than 22 percent lower than the original total revenue value while for FY85 the projection is more than 15 percent below the original value. Most of the differences can be accounted for by the much lower projected federal revenue dollars for FY84 and FY85. Therefore, the federal revenue component was targeted for review and consultation with the unit. It was found that the higher federal revenue values in the original budget for FY84 and FY85 were due to the fact that Cooperative Extension Service had submitted several proposals which are requesting in excess of $100.0 each and should they materialize, Cooperative Extension Service feels they will need that additional authority. Although the revenue projection data helped take a closer look at Cooperative Extension Service, no FY84 or FY85 original values were changed.

FIGURE 3.5

ACC FY84 AND FY85 NON-GENERAL FUND
REVENUE PROJECTIONS

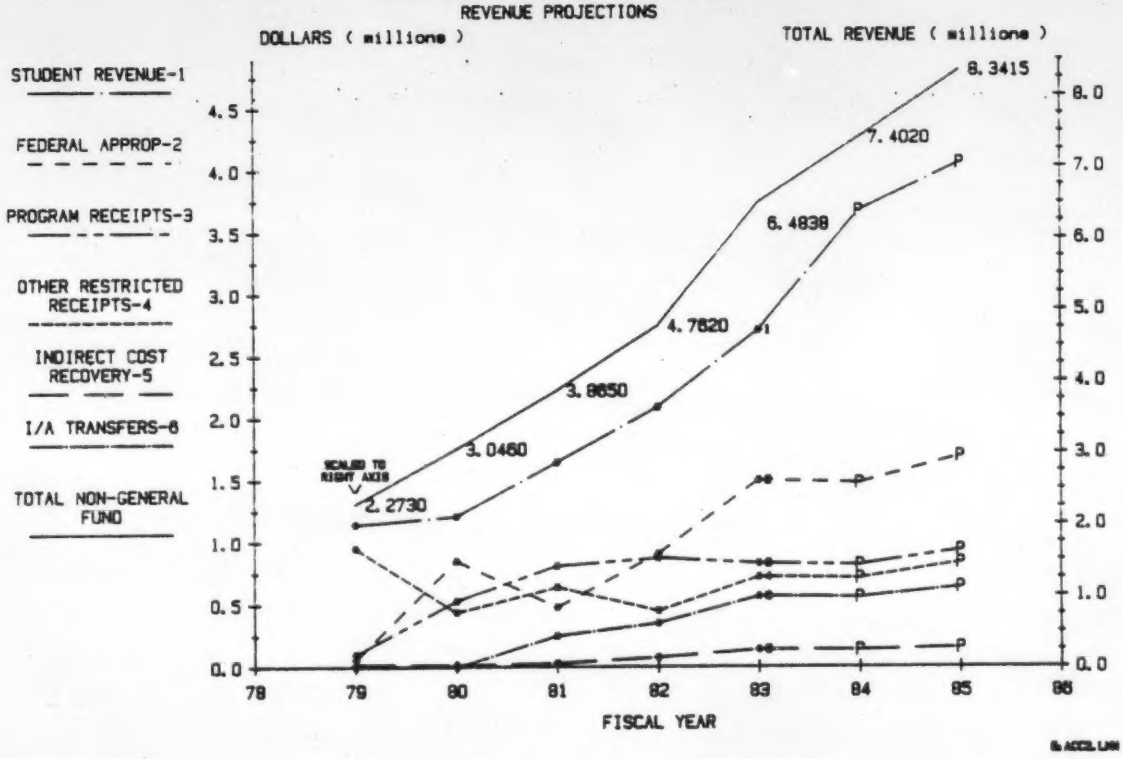


TABLE 3.5

ACC Original vs. Projected Revenue

Revenue Category		Revised FY84 Budget (X $1,000)	Percentage Difference	FY85 Budget (X $1,000)	Percentage Difference
Federal	Original	$ 1,270.4		$ 1,270.4	
	Projected	1,485.7	16.95	1,698.7	33.72
Other Restricted	Original	903.2		903.2	
	Projected	715.7	(20.76)	840.2	(6.98)
Student Fees	Original	3,619.5		3,882.7	
	Projected	3,678.3	1.62	4,062.2	4.62
Program Receipts	Original	1,034.1		1,083.1	
	Projected	822.6	(20.45)	940.5	(13.17)
Indirect Cost Recovery	Original	338.5		766.7	
	Projected	562.7	66.23	643.3	(16.09)
Intra-agency Receipts	Original	103.4		134.1	
	Projected	137.0	32.50	156.6	14.37
Total	Original	$ 7,269.1		$ 8,040.2	
	Projected	$ 7,402.0	1.83	$ 8,341.5	3.75

FIGURE 3.6

CES FY84 AND FY85 NON-GENERAL FUND
REVENUE PROJECTIONS

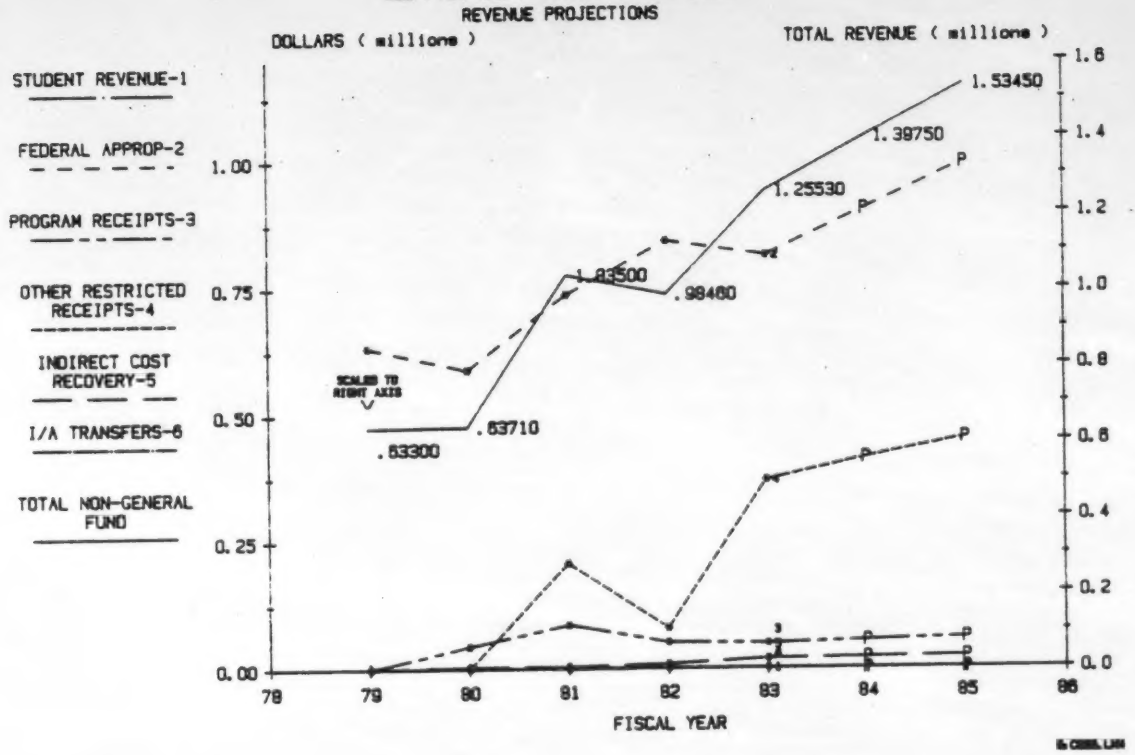


TABLE 3.6

CES Original vs. Projected Revenue

Revenue Category		Revised FY84 Budget (X $1,000)	Percentage Difference	FY85 Budget (X $1,000)	Percentage Difference
Federal	Original	$ 1,200.7		$ 1,200.7	
	Projected	906.1	(24.54)	996.9	(16.97)
Other Restricted	Original	515.5		515.5	
	Projected	416.0	(19.30)	454.7	(11.79)
Student Fees	Original	0.0		0.0	
	Projected	0.0	0.00	0.0	0.00
Program Receipts	Original	60.0		60.0	
	Projected	54.4	(9.33)	59.8	(0.33)
Indirect Cost Recovery	Original	30.0		30.0	
	Projected	21.0	(30.00)	23.1	(23.00)
Intra-agency Receipts	Original	0.0		0.0	
	Projected	0.0	0.00	0.0	0.00
Total	Original	$ 1,806.2		$ 1,806.2	
	Projected	$ 1,397.5	(22.63)	$ 1,534.5	(15.04)

Figure 3.7 and Table 3.7 highlight the historical and projected non-general fund revenue component values for Islands Community College. From Table 3.7 it can be seen that the projected total non-general fund for Islands Community College in FY84 was more than 24 percent lower than the original total value. For FY85 the projected total non-general fund was more than 16 percent lower than the original FY85 total value. Targeted for review were the federal revenue values for FY84 and FY85. In view of the revenue projections, the unit confirmed that excess authority did exist for the original federal revenue values and agreed to reduce the FY84 and FY85 values by $42.0 bringing them closer to the time-series projection. However, the unit requested that the $42.0 reduction in federal revenue values be added to the other restricted receipt values thereby increasing the FY84 and FY85 original other restricted values by $42.0, keeping the total non-general fund constant. An increased outreach commitment was given as the justification. Since the original other restricted receipt revenue values for FY84 and FY85 were already above the projections, the additional of $42.0 to both of these moved the resultant values even further from the projections. Although the federal revenue values were brought closer to the projections, other restricted receipts revenue values moved further away; the net affect being that the total non-general fund revenue for FY84 and FY85 for Islands Community College did not change.

Non-general fund revenue co ponent historical data and projections for Ketchikan Community College are provided in Figure 3.8 and Table 3.8. As has been the case for several of the previously reviewed BRUs, every FY84 original revenue component value is exactly the same as the original FY85 revenue component value. For Ketchikan Community College, this means that they expect exactly no change in any one of their revenue components between the two years. The revenue projections for FY84 and FY85 based on a time-series analysis of the trends over the previous five years indicate a much different picture. However, since the projections are based on historical trends, they cannot account for what possibly could result from increased mining activity in the Ketchikan area. In light of the uncertainty, the unit did not change any of the original revenue component values after projection data were provided.

FIGURE 3.7

ICC FY84 AND FY85 NON-GENERAL FUND
REVENUE PROJECTIONS

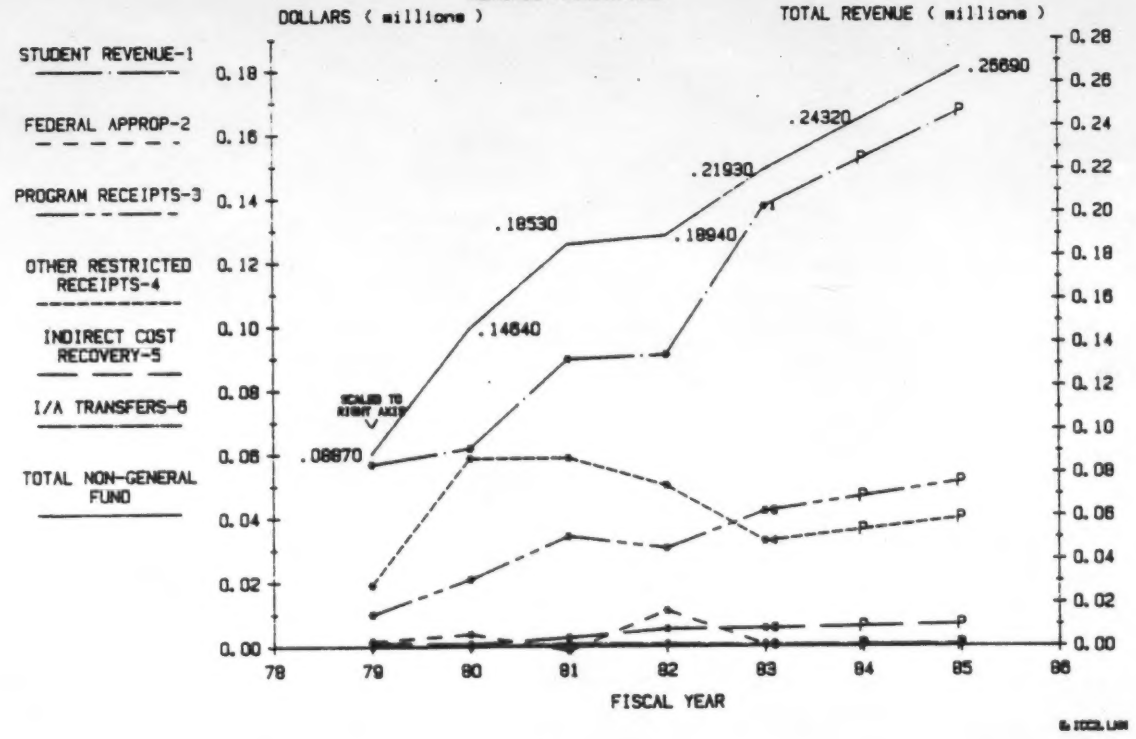


TABLE 3.7

ICC Original vs. Projected Revenue

Revenue Category		Revised FY84 Budget (X $1,000)	Percentage Difference	FY85 Budget (X $1,000)	Percentage Difference
Federal	Original	$ 47.0		$ 47.0	
	Projected	0.5	(98.94)	0.5	(98.94)
Other Restricted	Original	45.8		45.8	
	Projected	36.5	(20.31)	40.1	(12.45)
Student Fees	Original	158.9		158.9	
	Projected	152.5	(4.03)	167.4	5.35
Program Receipts	Original	61.1		61.1	
	Projected	46.9	(23.24)	51.5	(15.7)
Indirect Cost Recovery	Original	6.6		6.6	
	Projected	6.3	(4.55)	6.9	4.55
Intra-agency Receipts	Original	1.0		1.0	
	Projected	0.5	(50.00)	0.5	(50.00)
Total	Original	$ 320.4		$ 320.4	
	Projected	$ 243.2	(24.09)	$ 266.9	(16.70)

FIGURE 3.8

KECC FY84 AND FY85 NON-GENERAL FUND
REVENUE PROJECTIONS

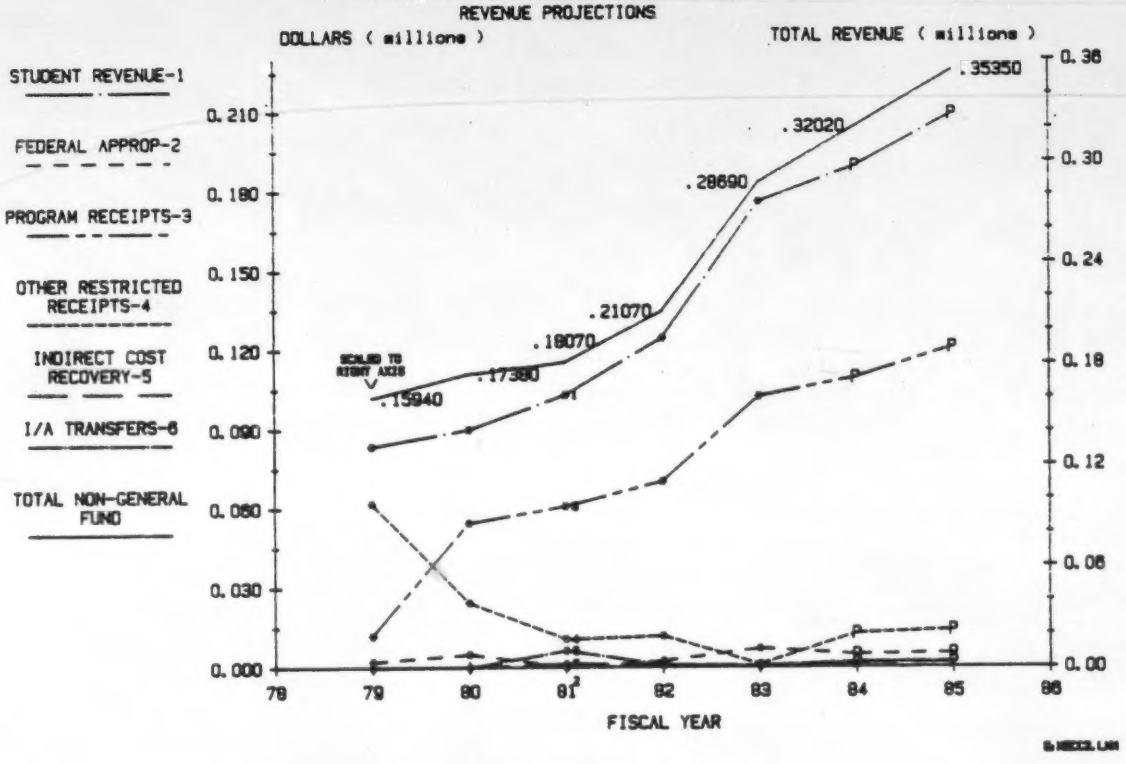


TABLE 3.8

KECC Original vs. Projected Revenue

Revenue Category		Revised FY84 Budget (X $1,000)	Percentage Difference	FY85 Budget (X $1,000)	Percentage Difference
Federal	Original	$ 2.7		$ 2.7	
	Projected	4.8	77.78	5.3	96.30
Other Restricted	Original	44.5		44.5	
	Projected	12.8	(71.24)	14.1	(68.31)
Student Fees	Original	194.7		194.7	
	Projected	189.6	(2.62)	209.4	7.55
Program Receipts	Original	126.0		126.0	
	Projected	109.5	(13.10)	121.0	(3.97)
Indirect Cost Recovery	Original	10.9		10.9	
	Projected	1.6	(85.32)	1.6	(85.32)
Intra-agency Receipts	Original	1.0		1.0	
	Projected	1.9	90.00	2.1	52.38
Total	Original	$ 379.8		$ 379.8	
	Projected	$ 320.2	(15.69)	$ 353.5	(6.92)

Figure 3.9 and Table 3.9 show the non-general fund revenue historical and projected values for Kodiak Community College. The total non-general fund projection for FY84 was more than 33 percent below the original value while for FY85 the projection was more than 32 percent below the original value. Most of this difference occurred due to the higher than projected original values in other restricted receipts which for both fiscal years were approximately $150.0 above the projected values. By regarding Figure 3.9, it can be seen that the other restricted receipts declined radically from FY82 to FY83 but it had also been showing a general downward trend since FY80. Consequently, the projections for FY84 and FY85 were quite low. The unit felt that what happened in FY83 was unique and expected the FY84 and FY85 other restricted receipts activity to be closer to the FY82 level. However, with the information provided by the projections, Kodiak Community College recommended revising other restricted receipts downward to a level of $226.3 for both FY84 and FY85 bringing them closer to the projections. Additionally, the federal revenues were recommended to increase from $1.2 in FY84 and FY85 to $25.0 in each year making the new figure nearly identical with the projected values. The unit recommended downward adjusting the indirect cost recovery original values of $39.7 in FY84 and $39.6 in FY85 to $25.0 in each year bringing them closer to the projections. Program receipts were also recommended to be reduced from their original FY84 level of $131.8 to $100.0. All FY84 changes were incorporated into the FY85 budget request document for Kodiak Community College.

Historical and projected non-general fund revenues for Kuskokwim Community College are presented in Figure 3.10 and Table 3.10. The total non-general fund revenue projection for FY84 did not differ significantly from the original FY84 value. The FY85 total non-general fund projection was more than 28 percent below the original FY85 figure. Most of this difference, as can be seen in Figure 3.10, was in the federal revenue component where the projected revenue was more than 45 percent below the original value. The federal revenue value for FY85 was targeted for unit review. With the additional information provided by the revenue projections, the unit recommended that the FY85 federal revenue value be adjusted from $415.6 to $225.0 making it almost equal to the projected value. This change was incorporated in the FY85 budget request document.

FIGURE 3.9

KOCC FY84 AND FY85 NON-GENERAL FUND
REVENUE PROJECTIONS

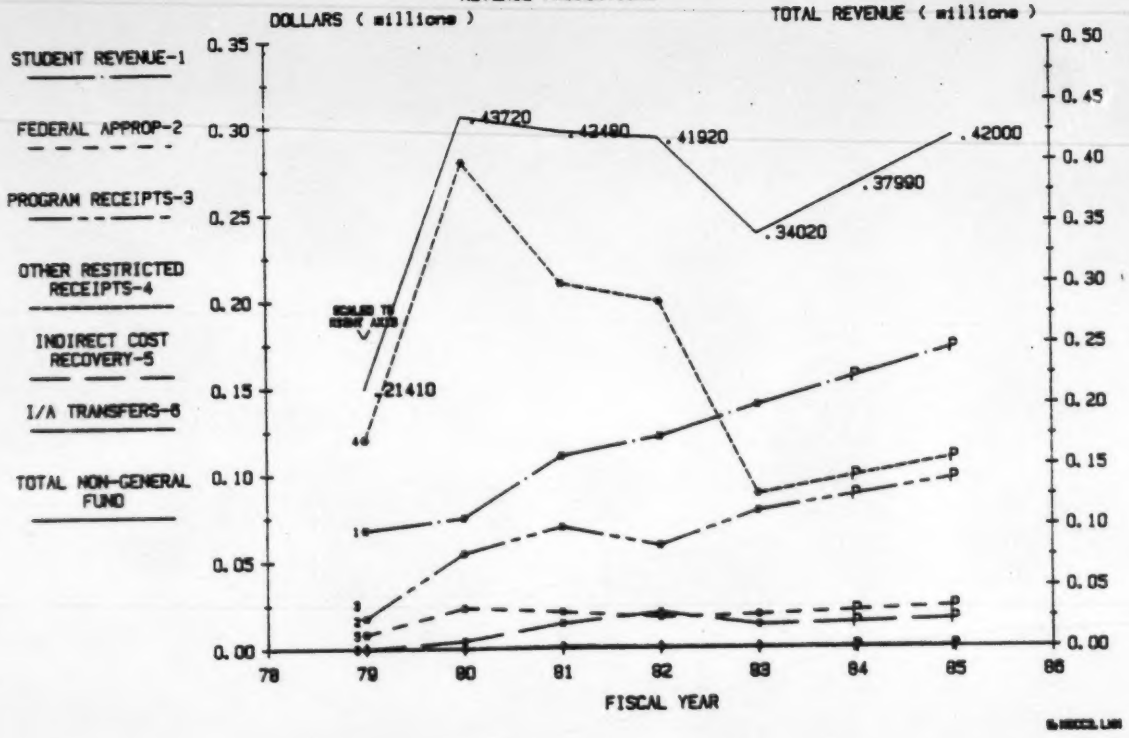


TABLE 3.9

KOCC Original vs. Projected Revenue

Revenue Category		Revised FY84 Budget (X $1,000)	Percentage Difference	FY85 Budget (X $1,000)	Percentage Difference
Federal	Original	$ 1.2		$ 1.2	
	Projected	21.4	1,683.33	23.7	1,875.00
Other Restricted	Original	250.1		250.1	
	Projected	99.0	(60.42)	109.4	(56.26)
Student Fees	Original	150.8		195.6	
	Projected	156.1	3.51	172.6	(11.76)
Program Receipts	Original	131.8		131.8	
	Projected	88.1	(33.16)	97.4	(26.1)
Indirect Cost Recovery	Original	39.7		39.6	
	Projected	14.7	(62.97)	16.3	(58.84)
Intra-agency Receipts	Original	1.3		1.3	
	Projected	0.6	(53.85)	0.6	(116.67)
Total	Original	$ 574.9		$ 619.6	
	Projected	$ 379.9	(33.92)	$ 420.0	(32.21)

FIGURE 3.10

KUCC FY84 AND FY85 NON-GENERAL FUND
REVENUE PROJECTIONS

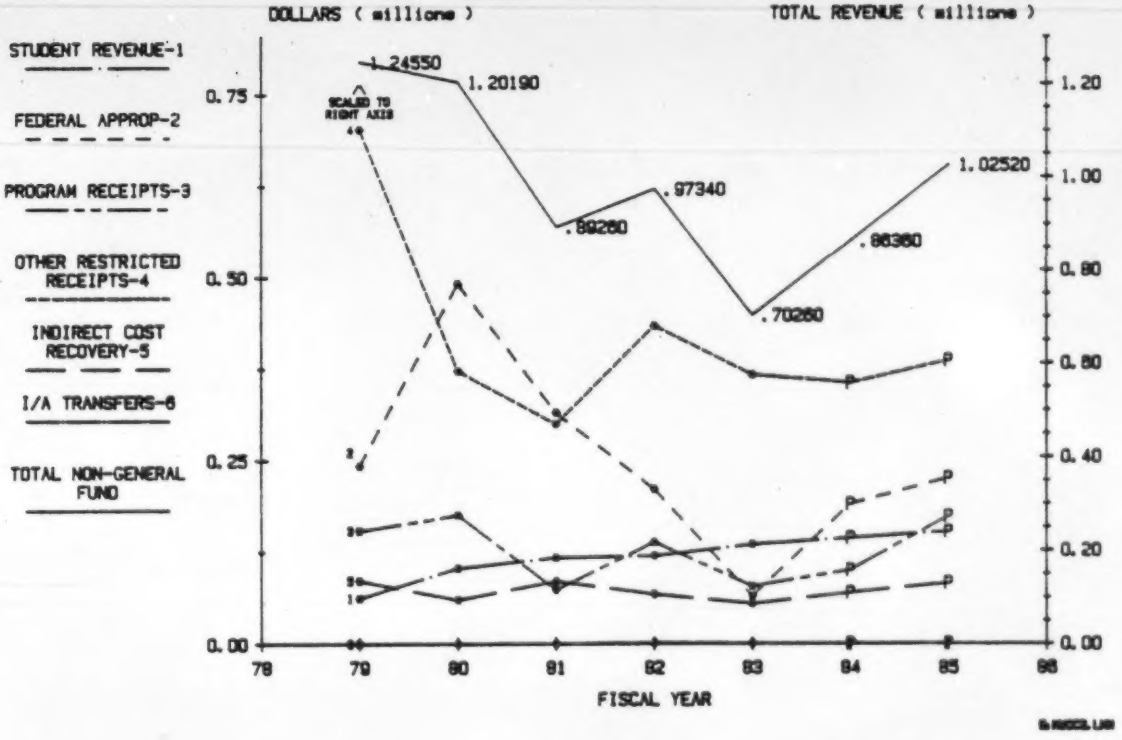


TABLE 3.10

KUCC Original vs. Projected Revenue

Revenue Category		Revised FY84 Budget (X $1,000)	Percentage Difference	FY85 Budget (X $1,000)	Percentage Difference
Federal	Original	$ 225.0		$ 415.6	
	Projected	190.9	(15.16)	226.5	(45.50)
Other Restricted	Original	370.0		590.3	
	Projected	356.3	(3.70)	387.1	(34.42)
Student Fees	Original	144.4		149.9	
	Projected	144.7	0.21	153.4	2.33
Program Receipts	Original	89.5		189.1	
	Projected	100.9	12.74	174.2	(7.88)
Indirect Cost Recovery	Original	74.4		79.4	
	Projected	70.2	(5.65)	83.3	4.91
Intra-agency Receipts	Original	2.0		2.0	
	Projected	0.6	(70.00)	0.7	(185.71)
Total	Original	$ 905.3		$ 1,426.3	
	Projected	$ 863.6	(4.61)	$ 1,025.2	(28.12)

Figure 3.11 and Table 3.11 depict the projected and historical non-general fund revenues for Matanuska-Susitna Community College. Both the FY84 and FY85 total non-general fund projections did not differ significantly from the original total revenue values. As indicated by the numbers in Table 3.11, five of the six revenue components had in at least one of the projected fiscal years, original versus projected value differences that exceeded ten percent. However, the amounts of money involved in three of these revenue components were less than $10.0 and, therefore, did not constitute a major concern. The unit recommended not adjusting any of the remaining revenue components' original values in light of recent population increases in the Mat-Su valley. The net result was that no adjustments were made to the Matanuska-Susitna Community College FY85 budget request figures.

Projected and historical non-general fund revenue data are presented in Figure 3.12 and Table 3.12 for Prince William Sound Community College. The projected FY84 total non-general fund value was more than ten percent below the original total value. For FY85, the difference between the total non-general fund projection and original value was insignificant. From Table 3.12, it can be seen why the major revenue components to be targeted included the FY84 and FY85 other restricted receipts revenue and the FY84 and FY85 program receipts revenue. The unit requested that the other restricted receipts revenue for FY84 not be changed due to conditions concerning city grants. The FY85 other restricted receipts value, however, was recommended to change from the $296.3 level to a new level of $359.5 bringing it closer to the projection. The FY84 program receipts revenue value was requested to be downward adjusted toward the projection to a new figure of $639.4. Additionally, the unit recommended changing the indirect cost recovery value for FY84 to the lower figure of $40.0 bringing it nearly equal to the projection while the indirect cost recovery FY85 value was recommended to be reduced to $42.5, again bringing the new number very close to the projection. The unit also recommended upward adjusting the FY85 student fees from $130.2 to $145.0 in a direction away from the projection. It was possible to include all FY84 changes in the FY85 budget request document.

FIGURE 3.11

MSCC FY84 AND FY85 NON-GENERAL FUND
REVENUE PROJECTION

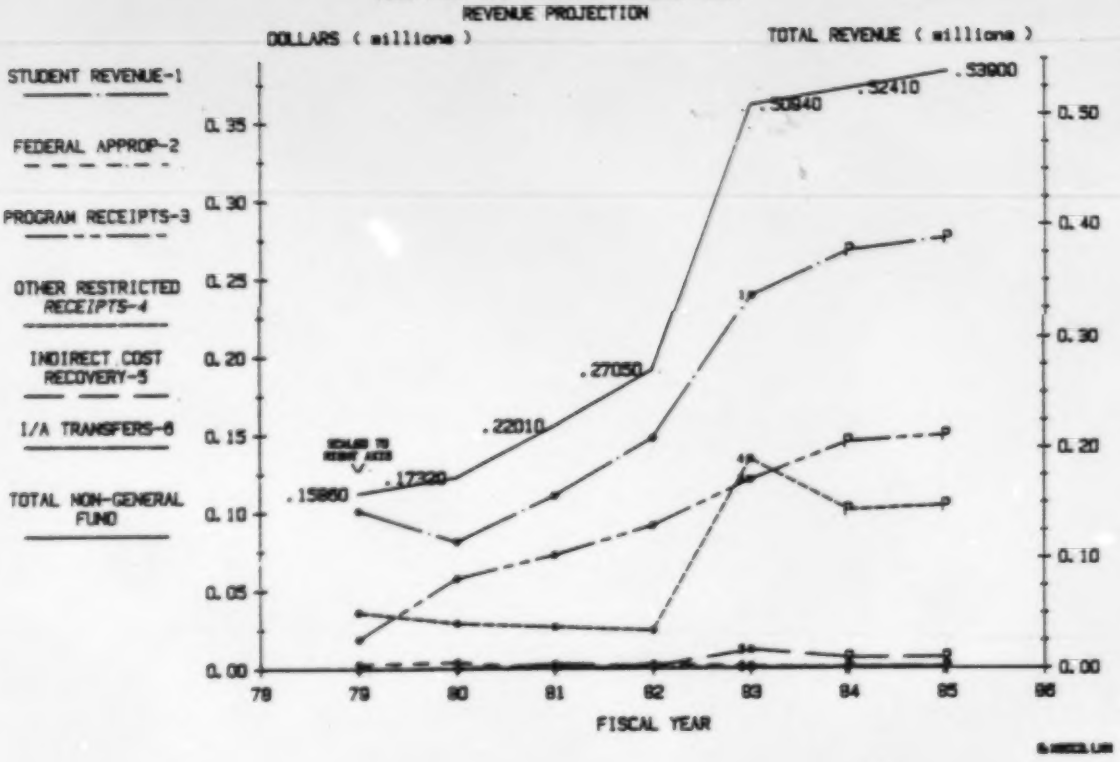


TABLE 3.11

MSCC Original vs. Projected Revenue

Revenue Category		Revised FY84 Budget (X $1,000)	Percentage Difference	FY85 Budget (X $1,000)	Percentage Difference
Federal	Original	$ 5.0		$ 10.0	
	Projected	0.4	(92.00)	0.4	(96.00)
Other Restricted	Original	76.4		76.4	
	Projected	101.9	33.38	104.8	37.17
Student Fees	Original	305.0		305.0	
	Projected	267.8	(12.20)	275.5	(9.67)
Program Receipts	Original	151.3		151.3	
	Projected	145.8	(3.64)	149.9	(0.93)
Indirect Cost Recovery	Original	4.9		4.9	
	Projected	7.0	42.86	7.2	46.94
Intra-agency Receipts	Original	1.5		1.5	
	Projected	1.2	(20.00)	1.2	(25.00)
Total	Original	$ 544.1		$ 549.1	
	Projected	$ 524.1	(3.68)	$ 539.0	(1.84)

FIGURE 3.12

PWSCC FY84 AND FY85 NON-GENERAL FUND
REVENUE PROJECTIONS

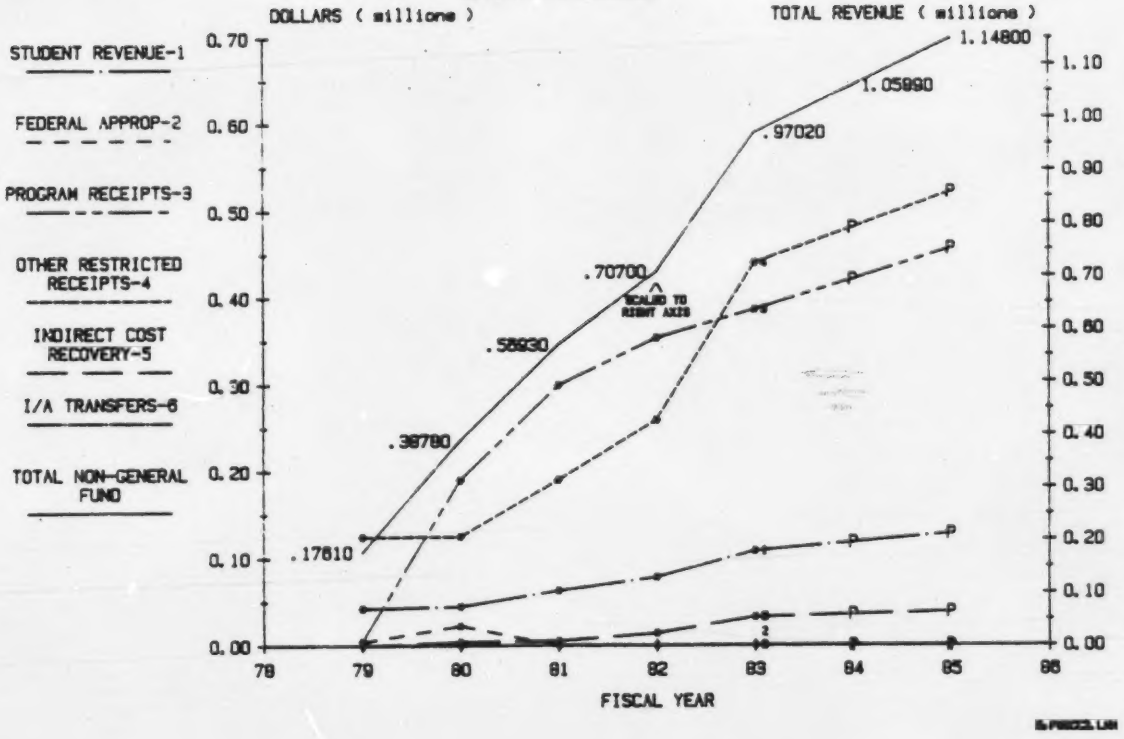


TABLE 3.12

PWSCC Original vs. Projected Revenue

Revenue Category		Revised FY84 Budget (X $1,000)	Percentage Difference	FY85 Budget (X $1,000)	Percentage Difference
Federal	Original	$ 0.0		$ 0.0	
	Projected	0.0	0.00	0.0	0.00
Other Restricted	Original	338.9		296.3	
	Projected	481.6	42.11	522.1	76.21
Student Fees	Original	130.2		130.2	
	Projected	118.9	(8.68)	128.9	(1.00)
Program Receipts	Original	660.3		650.0	
	Projected	421.9	(36.10)	457.40	(29.63)
Indirect Cost Recovery	Original	55.6		55.6	
	Projected	36.0	(35.25)	39.0	(29.86)
Intra-agency Receipts	Original	0.0		0.0	
	Projected	0.5	0.00	0.6	0.00
Total	Original	$ 1,185.0		$ 1,132.1	
	Projected	$ 1,058.9	(10.64)	$ 1,148.0	1.40

Figure 3.13 and Table 3.13 depict the non-general fund historical and projected revenues for Rural Education. Figure 3.13 shows that the seesaw pattern of the total non-general fund was primarily driven by the influence of federal appropriations. The projected FY84 total non-general fund was more than 31 percent below the original total value. The FY85 projection was more than 27 percent below the original total non-general fund value. FY84 and FY85 federal, other restricted receipts, student fees and program receipts revenues were targeted for review. The unit expected the original activity levels in all but student fees to be attained explaining basically that numbers represented recovery levels from a low point in FY83. The student fee revenue original value for FY84 was recommended to be downward adjusted from $485.5 to $380.0 bringing it very close to the projection. Student fees for FY85 were recommended to be moved from $485.5 to $400.0. It was possible to include the FY84 change into the FY85 budget request document.

The last unit reviewed was Tanana Valley Community College. Figure 3.14 and Table 3.14 show the historical and projected non-general fund values for Tanana Valley Community College. From Figure 3.14 it can be seen that the total non-general fund level has decreased sharply from the FY81 level primarily due to the drop in program receipts. Table 3.14 shows that in FY84 the projected total non-general fund value was more than 16 percent below the original total value while for FY85 the projection is more than 20 percent below. Targeted for review were the FY84 and FY85 original revenue values for other restricted receipts, the FY85 original value for student revenue, and the FY84 original value for program receipts. With the revenue projection information provided, the unit recommended that the FY84 other restricted receipts level be changed from $343.4 to $275.0 and the FY85 amount of $343.3 be reduced to $300.0 bringing both of the figures closer to the projections. The FY85 student revenue was recommended to be downward adjusted from $747.1 to $707.1, again moving toward the projection. The FY84 program receipts value was not recommended to be changed. The unit felt that program receipts would not recover as quickly as the projections indicated. It did recommend that the $331.7 FY85 program receipts figure be reduced to $271.7. It was possible to include all the requested changes by Tanana Valley Community College into the FY85 budget request document.

FIGURE 3.13

RE FY84 AND FY85 NON-GENERAL FUND
REVENUE PROJECTIONS

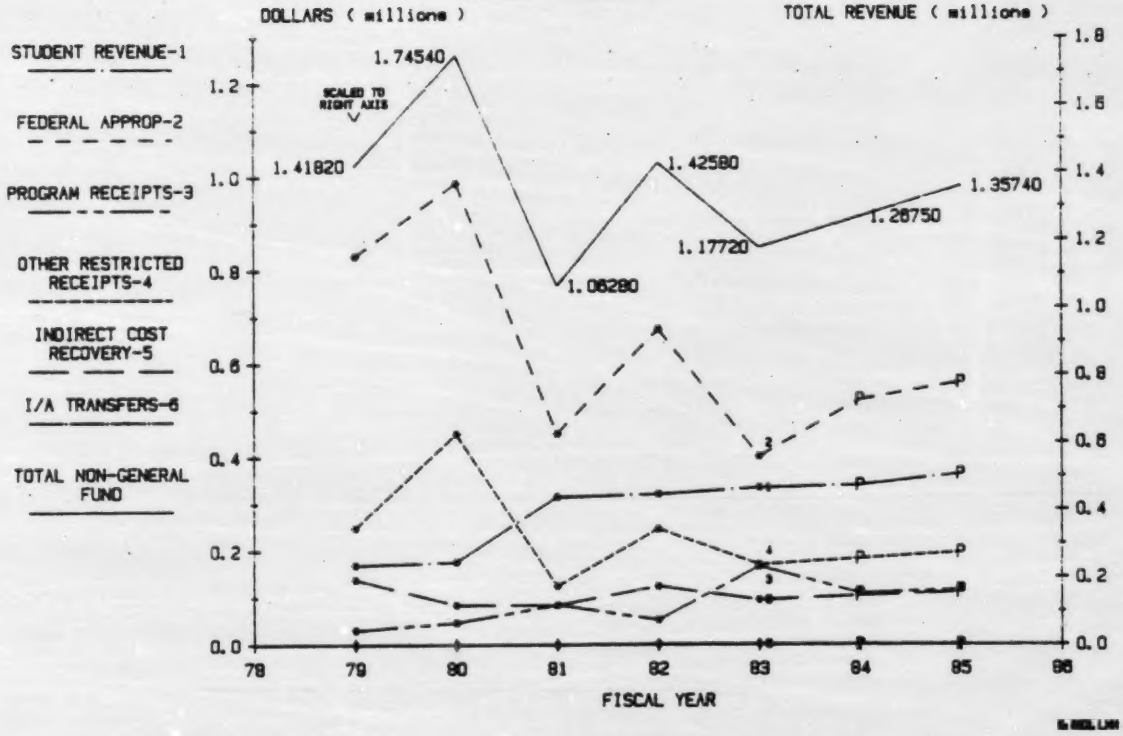


TABLE 3.13

RE Original vs. Projected Revenue

Revenue Category		Revised FY84 Budget (X $1,000)	Percentage Difference	FY85 Budget (X $1,000)	Percentage Difference
Federal	Original	$ 659.9		$ 659.9	
	Projected	524.3	(20.55)	561.5	(14.91)
Other Restricted	Original	390.0		390.0	
	Projected	184.9	(52.59)	198.0	(49.23)
Student Fees	Original	485.5		485.5	
	Projected	341.7	(29.62)	365.9	(24.63)
Program Receipts	Original	211.7		226.7	
	Projected	110.0	(48.04)	117.8	(48.04)
Indirect Cost Recovery	Original	106.7		106.7	
	Projected	105.5	(1.12)	113.0	5.90
Intra-agency Receipts	Original	2.5		2.5	
	Projected	1.1	(56.00)	1.2	(108.33)
Total	Original	$ 1,856.3		$ 1,871.3	
	Projected	$ 1,267.5	(31.72)	$ 1,357.4	(27.46)

FIGURE 3.14

TVCC FY84 AND FY85 NON-GENERAL FUND
REVENUE PROJECTIONS

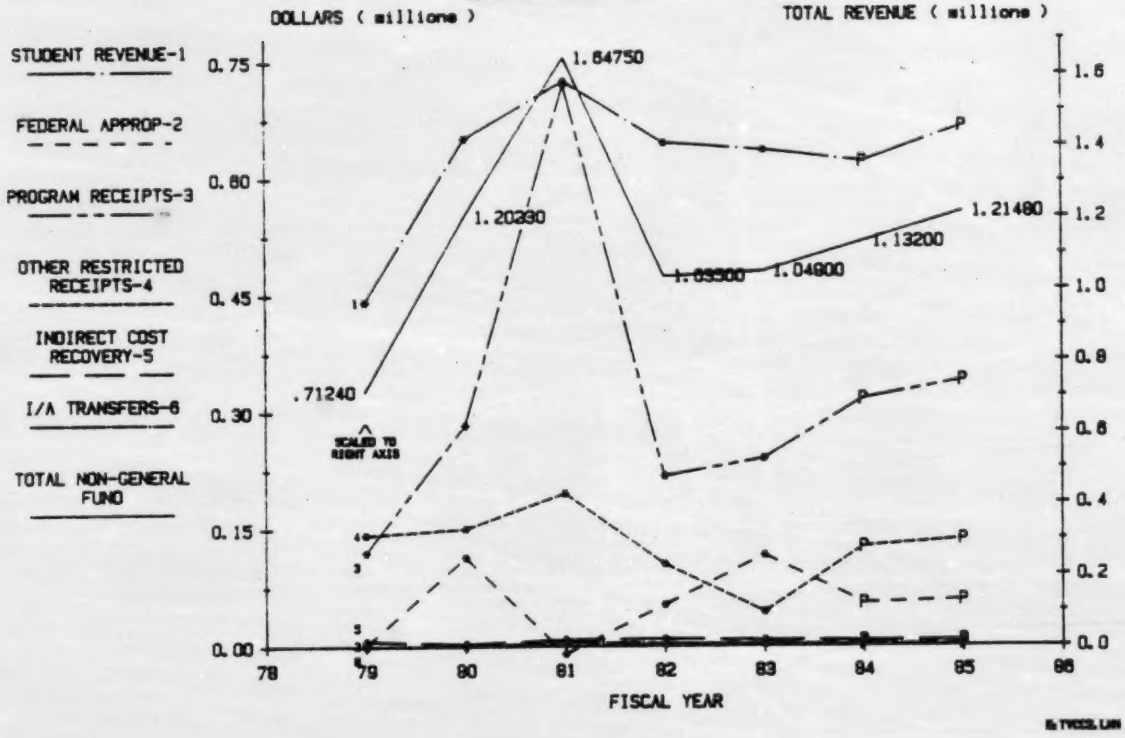


TABLE 3.14
TVCC Original vs. Projected Revenue

Revenue Category		Revised FY84 Budget (X $1,000)	Percentage Difference	FY85 Budget (X $1,000)	Percentage Difference
Federal	Original	$ 80.0		$ 80.0	
	Projected	55.4	(30.76)	59.4	(25.75)
Other Restricted	Original	343.4		343.3	
	Projected	128.0	(62.73)	137.4	(59.98)
Student Fees	Original	587.6		747.1	
	Projected	621.4	(9.63)	667.0	(10.72)
Program Receipts	Original	231.7		331.7	
	Projected	317.6	37.07	340.9	2.77
Indirect Cost Recovery	Original	10.0		10.0	
	Projected	7.2	(28.00)	7.8	(22.00)
Intra-agency Receipts	Original	9.5		9.5	
	Projected	2.4	(74.74)	2.3	(313.04)
Total	Original	$ 1,362.2		$ 1,521.6	
	Projected	$ 1,132.0	(16.90)	$ 1,214.8	(20.16)

Summary

Chapter III provides the results of the original time-series revenue projections for 14 BRUs in the University of Alaska system. Due to various constraints, it was not possible to derive revenue projections for every BRU this year. Projections were made for two years, FY84 and FY85, utilizing a number of time-series forecasting techniques. The projections were distributed to the units for their information and recommendations concerning any changes to the FY85 budget request document were solicited. The major differences between projected and FY85 budget document revenue amounts were documented as well as any of the changes that were initiated due to the projection data were distributed. In light of the additional information provided by the trend projections, changes were made in the FY84 and FY85 budgeted revenue amounts for eight of the 14 BRUs analyzed.

For the nine BRUs that had projections varying more than 10% from what was originally budgeted, all of the projections were below the original values. Similarly for FY85, for the seven BRUs that varied more than 10% from the originally budgeted revenues, the projections were also below original values. Only at UA/Anchorage, Anchorage Community College and Prince William Sound Community College were the total non-general fund projections higher in at least one of the fiscal years when compared with the original values. Projections and originally budgeted non-general fund totals were within 10% of each other for both fiscal years at UA/Fairbanks, UA/Anchorage, Anchorage Community College and Matanuska-Susitna Community College.

CHAPTER IV

SUMMARY

> An uncertain future makes it more important to plan but it also makes it more difficult to plan ... We shall not be able to predict the future with accuracy, but we can build alternative images of the future and devise ways to survive in an uncertain future. (Hobbs, 1979, pp 3-4)

The above statement embodies both the overall need and eventual goal of the approach to quantitative fiscal planning described in this study. The planning approach described here is best viewed as one model among several viable approaches. The steps that comprise the three distinct phases of the approach include completing a time-series analysis of historical trend data, researching various causal factors for predicting future levels of activity, and lastly, integrating both time-series and causal results in a fashion that allows for generating and testing multiple future scenarios. The practical utility of this research hinges partly on how fully Miller's (1971) five modeling "success requirements" are met:

1. Top management's acceptance of and commitment to the effort are critical.

2. There must be some translation device [i.e., report] to make the model understandable to those who will use its output.

3. Assumptions must be explicit since these are critical in the development of a valid model.

4. The [research and development team] should make sure it succeeds in its projects, and it should achieve notable success early in its life.

5. The [research and development team] should always put matters into terms that express the general manager's priorities and view of the world. (p. 154)

The purpose of this Phase I report is to outline what progress has been made toward a quantitative fiscal planning model for the University of Alaska system. This report represents the initial effort on just one aspect of that planning model: the results of using various time-series forecasting techniques to derive non-general fund revenue projections for FY84 and FY85 for 14 University Budget Request Units (BRUs).

Specifically, a comparison between forecasted non-general fund revenue components and FY84 Revised Budget and FY85 Request Budget numbers from the original FY85 Budget Request Document indicated that almost without exception, forecasts were lower than budgets. The new information provided by the forecasts was used to downward adjust budgets in eight of the 14 BRUs for which forecasts were reviewed. Although these projections provided immediate information for assessing and improving specific budget amounts, of even greater value will be the process of improved integration of institutional objectives with realistic long-range revenue projections.

In sum, the quantitative planning approach described and the research required to implement it represent the first time a project of this nature has ever been undertaken for the University of Alaska system. As such, it will contribute not only to quantifying various relationships that exist among activities, but also to discovering what those complex and difficult to comprehend relationships are. Indeed,

> . . . the very act of constructing models invariably generated new insights into the nature of the [university] and the factors that make it successful or not. Once the essence of a [university] has been exposed, as it must be if a valid model is to be constructed, the model serves as an invaluable aid to communication among those who must cooperate to further the health and growth of the [university]. (Miller, 1971, p.41)

Perhaps a quote from Weathersby and Weinstein best concludes this Phase I report:

> Many funders and some managers of higher education recognize that the institutional budgets embody the values and objectives of the institution and describe its intended future evolution. In other words, the capital and operating budgets are instruments both of planning and of control -- which are the essence of current institutional conflict. As is often the case in management science, the analyst must decide whether to look for problems with easy solutions or to engage crucial problems on some uncharted sea. While the former is the more comfortable (and usual) course, the latter may well prove to be the most productive. (1970, p. 2)

Caveats

A comparative study was conducted by Armstrong and Grohman (1972) on the accuracy of various forecasting methods. The conclusions of that study highlight the several caveats that need to be understood when interpreting the results of the time-series revenue projections. Table 5.1 depicts a matrix that classifies the major forecasting methods along an objective/subjective dimension and a naive/causal dimension. Using the convention of this table, the following study conclusions were made:

1. Objective methods are more accurate than subjective methods.

2. Causal methods are more accurate than naive methods.

3. The superiority of objective and causal methods increases as the forecast horizon increases.

4. Therefore, econometric methods will produce more accurate long-range forecasts than may be obtained from novice judgment, extrapolation, or expert judgment.

TABLE 4.1

Characteristics of Forecasting Methods

	Naive	Causal
Objective	Extrapolation (Time-series)	Econometric
Subjective	Novice Judgment	Expert Judgment

The revenue projections presented in this Phase I report were derived primarily using extrapolation methods (time-series) with some integration of novice and expert judgment. In view of this, the following caveats exist:

1. Time-series forecasting methods are inherently conservative. They do not predict sudden, "step-function" changes that are out of line with historical trends. An example would be a small community college receiving a large new grant.

2. Time-series projections are not causal, but are based strictly on historical trend data analyses. To elaborate on exactly what this means, take the situation where the service area population for a particular commmunity college is expected to jump by 10% next year. For the last five years it has risen at a constant yearly rate of 1%, and enrollments (and the student revenue they generated) have increased similarly. A straightforward time-series student revenue projection based on five years of steady 1% student revenue increases results in a 1% projected revenue increase which would seriously underestimate what will actually occur if the population does rise as expected. If the student revenue projection included casual relationships and service area population was one of the causal variables, the impact on the projected student revenue due to the sudden jump in population can be incorporated. The next phase of the revenue sub-model derivation requires researching what casual relationships exist for each revenue component.

3. In view of the need for accurate historical data, every attempt was made to guarantee that the data used were consistent from year-to-year. Although data were distributed to each MAU for their verification, not every BRU could be thoroughly reviewed. Consequently, some data may not be perfect.

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